SCIENCE

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FRIDAY, MAY 26, 1905.

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THE GENERAL MEETING OF THE AMERICAN PHILOSOPHICAL SOCIETY.

THE annual general meeting of the American Philosophical Society was held this year during Wednesday, Thursday and Friday of the second week in April. The sessions as usual were held in the rooms of the society in Philadelphia. The number in attendance, including non-resident members, resident members and others, was quite as large as on previous similar occasions, while the quantity and character of the papers offered, together with the discussion on them, called forth much favorable comment. The program was especially broad in its scope, including the various departments of natural and physical science, of literature and of problems in economics.

On Thursday the society sent, through its secretary, Dr. I. Minis Hays, a telegram of greeting to the University of Virginia on the occasion of the inauguration of a president of its faculty. This was done in special commemoration of the fact that Thomas Jefferson, the founder of the university, was also an early president of the American Philosophical Society.

The meeting was opened on Wednesday afternoon at 2:30 o'clock by the president, Vice-Provost Edgar F. Smith, of the University of Pennsylvania, with a brief address of welcome, after which the following papers were presented:

The Weal-Relation: Professor LINDLEY M. KEASBEY, of Bryn Mawr, Pa.

A Plea for Governmental Supervision of Posts Necessitating Normal Perception of Color: Dr. Charles A. Oliver, of Philadelphia.

The Present Status of the International Catalogue of Scientific Literature: Dr. Cyrus Adler, of Washington.

The Composite Character of the Babylonian Creation Story: Professor Morris Jastrow, Jr., of Philadelphia.

In the course of his address on 'The Composite Character of the Babylonian Creation Story,' Professor Jastrow referred to the progress made in recent years in the interpretation of the Babylonian creation tale, thanks chiefly to the discovery of new fragments of the story in the remains of the famous Assyrian library of Ashurbanapol, at Nineveh.

"We now know," he said, "that the narrative in the form of a poem consisted of about 1,000 lines, of which three fourths have been found. The version of the story which we have is the one that was produced in the city of Babylon by the priests of Marduk, the chief god of the later Babylonian Pantheon. This god is, therefore, introduced as the creator and as playing the principal part in the struggle between the gods and an army of monsters led by Tiamar.

"The 'Babylon' version of the creation story rests on an older tale, which originated in Nippur, and in which the chief god of that city, who was called Bel, is the hero. When the 'temple library' of Nippur shall be discovered, or if it has been discovered, we may expect to find this older version. At present we may conclude from the 'Babylon' version that an earlier 'Nippur' version existed. There was, however, also a third version, which originated in Eridu, one of the most ancient religious centers of Babylonia, and in which the god Ea played the chief rôle.

"In the 'Babylon' version the two older versions, that of Nippur and that of Eridu, have been combined to form the Marduk epic. Bel's name and rôle are transferred to Marduk, and, likewise, Ea's prerogatives. A trace of the three versions is to be seen in the opening lines, which designate three beings, all synonyms of one another, as the symbol of the water chaos which preceded the organization of the regular workings of nature."

The English Masque: Professor Felix E. Schelling, of Philadelphia.

The English masque is a by-form of the English drama which flourished between the years 1597 and 1658, and is absolutely definite in its nature and characteristics, and to be defined as that species of the entertainment, the nucleus of which is a dance. The masque was usually presented at court as the setting of a ball and the actors in its serious parts were the nobles and ladies attendant on royalty. The masque is based on the revels, disguisings and maskings popular in England and, especially at court, from time immemorial. It is in no wise a derivative in any essential feature of similar festivities of Italy or France; but was developed as a definite product of literary and histrionic art chiefly in the reigns of King James and King Charles I. Thomas Campion, the musician, and Samuel Daniel, the court poet, wrote its earliest forms; but it was perfected mainly in the hands of Ben Jonson, who added the antimasque, or contrasted comedy element; while Inigo Jones, the royal architect, brought its costuming, scenic features and mechanical devices for stage effect to a surprising degree of perfection. The list of less than sixty masques within this period is surrounded by many dramatic compositions of a character more or less similar. But even Milton's Comus,

commonly designated a masque, is not, strictly speaking, such a production.

The distinguishing features of the masque were its allegorical presentation of matter supposedly fitting to the occasion; its lyrical poetry; its novel musical effects and combinations both vocal and instrumental, the gorgeousness and costly quality of its costuming; the ingenuity of its stage settings and mechanical devices for stage effect; its mingling in one performance, though in separate parts, the amateur with the professional actor; and scenes of comic relief offered in the antimasque performed by professional singers, dancers and players.

The Emancipation of the Waterways: Professor LEWIS M. HAUPT, of Philadelphia.

In his paper on the 'Emancipation of the Waterways,' Professor L. M. Haupt traced first the beneficial effects of improvements in the capacity of navigable channels in lowering the rates of freight, as for grain from Chicago to New York from 29.6 cents per bushel in 1866 to 4.7 cents in 1903, due to the enlargement of the Soo canal from 12 to 20 feet. He quoted Senator Frye to the effect that the saving on lake freights in one year was five times the total cost of the entire lake system, and estimated that the saving on the tonnage of 1903 was $194,660,408. He then showed the increased value to result to the western farmer by the proximity of navigable channels as illustrated in the lower prices received in Nebraska, Kansas and Missouri as compared with states nearer the seaboard, and that this difference was the cost of the overland haul. On cereals alone this charge amounted to a loss to Nebraska of over $14,000,000 as compared with prices in Kansas, a little nearer water rates. The policy of European countries owning railways was then stated to be a return to the rapid and extensive development of their canal systems to encourage the delivery of raw materials for manufactures in the competition for the world's markets as in France, Belgium, Holland, Germany, Russia, Austria, Italy, etc., where thousands of miles are under construction with improved hydraulic and electric lifts and with electric haulage, for barges of from 300 to 1,000 tons.

The decadence of and opposition to the canals in this country are shown in the abandonment of over 700 miles in Pennsylvania; 656 in Ohio; 269 in New York, etc.; and the effort now on foot in the latter state to prevent the enlargement of the Erie to even 12 feet, so as to retain some of the grain trade which must otherwise go to Canadian ports.

The great profit-earning capacity of canals under corporate control was shown in the case of the English and American canals which have been maintained, as compared with those managed by railways, which was stated to be due to the small cost of operation.

In 1835 there were 2,700 miles of canals in operation in the United States, but by 1889 it had fallen to 2,305 miles, while the railroads had increased in the same time from 1,000 to 158,000 miles, and were still opposing waterway legislation, although it was believed, in the speaker's opinion, to be the most beneficial auxiliary to the development of railway revenues, as shown by the stock quotations of the roads having deep-water competition.

The great pressure upon Congress, the shortness of the sessions and the enormous demands for enabling legislation which have been accumulating for years, in some cases more than a half century, lead to the conclusion that much more satisfactory results could be secured for the emancipation of our waterways by a return to the early policy under which they were developed by

private or state control, locally, with powers to exercise the rights of eminent domain as is still done in the case of highways and railroads.

The Beginnings of Lumbering as an Industry in the New World: Mr. John E. Hobbs, of North Berwick, Me.

THURSDAY, APRIL 31.

Morning Session—10:30 O'clock.

President Smith in the chair.

The Structure of the Lignified Cell Wall: Professor John M. Macfarlane, of Lansdowne, Pa.

The lignified cell wall has been regarded as built up of a series of lamellæ deposited from without inward on the primary cellulose membrane, all of the lamellæ being in direct contact with each other. The stratified appearance has been explained by Hanstein, Strasburger and others as due to 'water-poor' and 'water-rich' layers.

From a study of numerous types of indurated element drawn from many of the vascular plants, the speaker stated that he regarded the lamellæ as quite distinct from each other, and separated by spaces usually as wide as the lamellæ themselves. The aniline sulphate and phloroglucin reactions clearly showed the lignin lamellæ colored, while the cavities or inter-lamellæ were unaltered. Aniline stains that act on lignified walls, such as safranin and aniline purple colored the lamellæ deeply and left the inter-lamellæ unstained. By appropriate protoplasmic stains, the inter-lamellæ were found to contain diffuse protoplasmic material in connection with the intercellular protoplasmic threads that penetrated the pores of the cell walls. The lamellæ were held in connection by fine lignin processes that stretched from lamella to lamella. The number of distinct lamellæ might vary from two to ten in the ordinary sap-conducting xylem tracheids and the fibrous sheath cells of the monocotyledonous bundle, to as many as from sixty to seventy in the indurated cells from the cortex of different plants.

That the lignified wall is built up of distinct lamellæ that alternate with interlamellar cavities containing protoplasm, gives a new conception as to the pathway for the ascending crude sap current and for the distribution of nutritive liquids through the tissues of the plants. It also furnishes valuable data for building up a correct conception of the minute structure of plant tissues, alike from the standpoint of intercellular protoplasmic continuity and of cell wall growth.

New Species of Genus Nepenthes: Professor John M. Macfarlane, of Lansdowne, Pa.

Five new species of pitcher plant were fully described or referred to in connection with his recent studies. These included *N. Beccariana* and *N. neglecta,* both obtained from the herbarium of Professor Beccari, of Florence; *N. Hemsleyana,* identified as a new species from specimens collected during the Burbidge and Veitch Expedition to North Borneo; *N. Copelandi,* determined and named by Dr. Merrill, head of the Botanical Survey of the Philippine Islands, and *N. Macfarlanei,* a species named by Mr. Hemsley, curator of the herbarium at Kew, from material discovered by the speaker in Kew Herbarium.

On Thought Transference Among Animals by Touch and Scent: Mr. Alden Sampson, of Haverford.

Mosaic Development in Ascidian Eggs: Professor Edwin G. Conklin, of Philadelphia.

The Oligodynamic Action of Copper Foil on Certain Intestinal Organisms: Henry Kraemer.

The classical experiments conducted by Nägeli during the eighties for determining the toxicity of solutions of copper produced by placing clean copper coins in distilled water for several days, on *Spirogyra*, a filamentous alga, was reviewed.

It was pointed out that Nägeli observed that the effects produced by the copper solution so obtained, on *Spirogyra*, differed from those due to ordinary chemical poisoning, and that in describing the supposedly distinctive effects of such minute traces of copper in solution (he having estimated that approximately 1.3 parts of copper to 1,000 million parts of water would kill *Spirogyra*), he used the term 'oligodynamische,' meaning thereby the force or action exerted by a small quantity of substance.

Reference was made to the very great importance of Nägeli's discovery from a scientific point of view, and the statement made that while researches of the kind conducted by Nägeli and other writers since his time had an important bearing on pharmacology, it was not, however, until the publication of the bulletin on 'A Method of Destroying or Preventing the Growth of Algæ and Certain Pathogenic Bacteria in Water Supplies,' by Moore and Kellerman nearly a year ago, that the very great practical significance of work along these lines became apparent and general interest was aroused in the subject.

Since last fall the author has carried on a number of series of experiments with the particular end in view of testing the efficiency of metallic copper for destroying typhoid and colon bacilli. The technique was described, and the following conclusions drawn from the results obtained as well as those given by other writers:

1. Certain intestinal bacteria, like colon and typhoid, are completely destroyed by placing clean copper foil in water containing them, or by adding the organisms to water previously in contact with the foil.

2. The toxicity of water to which either copper coins or copper foil has been added is probably due to the solution of some salt of copper, as first suggested by Nägeli.

3. The copper is probably in the form of a crystalloid rather than that of a colloid, as it has the property of permeating the cell walls and organized cell-contents of both animals and plants, thereby producing the toxic effects.

4. While the effects produced by the oligodynamic action of copper are apparently different from those of true chemical poisoning, the difference is probably in degree only and not in kind.

5. Certain lower organisms, including both plants and animals, possess a specific sensitiveness to minute quantities of copper and other substances as well, and it has been shown that they are not restored on transferring them to water free from oligodynamic properties.

6. Oligodynamic solutions of copper are obtained by adding copper coins, copper foil, or salts of copper to water. When copper foil is allowed to remain in distilled water from one to five minutes sufficient copper is dissolved by the water to kill typhoid organisms within two hours.

7. A solution of copper may lose its toxicity by the precipitation of the copper as an insoluble salt or compound, by its absorption by organic substances, or by adsorption by insoluble substances.

8. The oligodynamic action of the copper is dependent upon temperature as first pointed out by Israel and Klingmann.

9. The effects of oligodynamic copper in the purification of drinking water are in a quantitative sense much like those of filtration, only the organisms removed, like *B. typhi* and *B. coli*, are completely destroyed.

Observations on Columbium and Tantalum: Dr. EDGAR F. SMITH.

No difficulty was experienced in separating these elements. It was found that tantalum formed two or more double salts with the fluoride of each of the alkali metals. It was further shown that by virtue of this fact the double fluorides were not to be regarded as suitable material with which to determine the atomic weight of tantalum. Similar work was being done with columbium. The latter has not yet been freed absolutely from titanium, although certain methods being used at present promise well.

Tantalic and columbic oxides are both volatile in a current of carbon tetrachloride, the first yielding tantalum pentachloride and the second columbium oxychloride.

The Effects on Metabolism of Preservatives Added to Foods: H. W. Wiley, M.D., of Washington.

During the past three years we have studied in the Bureau of Chemistry in the Department of Agriculture, the various effects produced upon health and digestion by the addition of preservatives to food products. The substances which have been studied are boric acid, borax, salicylic acid, salicates, sulphurous acid, sulphite, benzoic acid, benzoates, formaldehyde and copper sulphate. The medical effects of all these bodies were carefully observed and recorded. The effects on metabolism were studied by weighing and analyzing the foods received, and collecting and analyzing the excreta of those under observation. The number of persons under observation has, in all cases, been twelve, except where accidental illness has diminished the attendance at the table. The effects produced upon the balance show the total quantity of any element ingested in the food and the amount recovered in the excreta. The research embraced protein, phosphoric acid, sulphuric acid, carbohydrates and fats. Only the data for boric acid and borax have been published. The other data are in course of preparation.

The general effect of borax and boric acid is: (1) To diminish or tend to diminish the weight of the body; (2) to diminish the avidity of the appetite; (3) a tendency to diminish the per cent. of nitrogen excreted, which, slightly marked in the preservative period, was even more marked in the after period, showing an accumulative effect in this direction; (4) the development of a tendency to increase the excretion of phosphorus. All the data taken together show that 97.3 per cent. of the phosphorus digested in the food was recovered during the fore period, 103.1 per cent. during the borax period, and 97 per cent. during the after period; (5) a tendency to increase, to a slight extent, the combustion of fat in the food; (6) a tendency to slightly diminish the total calories obtained from the food; and (7) a tendency to increase the quantity of solids in the food eliminated in the feces. This condition is easily explained in the tendency established during the exhibition of the preservative to slightly derange the digestive functions. The data also show that nearly 80 per cent. of the total borax and boric acid ingested in the food are excreted in the urine and the rest, apparently, through the skin.

The general result shows a greater or less derangement of metabolic processes of a character tending to injure the health.

Electroanalysis with a Rotating Anode and Mercury Cathode: Lily G. Kollock and Dr. Edgar F. Smith, of Philadelphia.

A number of metals may be rapidly precipitated in this way. The quantity of metal deposited in from four to seven minutes varies from a quarter to more than one half gram. The use of the mercury as cathode does away with a platinum dish

or cone and greatly reduces the expense incurred in general electrolytic work. The metals studied were cadmium, zinc, iron, nickel, copper, cobalt and bismuth.

Afternoon Session—2:30 O'clock.

Vice-President Scott in the chair.

The Rounded Sands of Paleozoic Formations: GILBERT VAN INGEN, Princeton, N. J.

Certain sandstones and dolomites of Paleozoic age contain well-rounded grains of detrital quartz having the mat surface peculiar to sand which has been rounded during transportation by wind. Some of these sandstones are considered by the author to be of desert origin, others to represent fossil barrier bars and spits, still others dunes. The sand of the dolomites is believed to owe its presence in those marine rocks either to flotation from a barrier bar or spit or to transportation by wind from a desert or dune-covered shore. The evidence of these sand grains on paleogeographic conditions is briefly discussed.

A Review of Lacroix's Work on the Montagne Pelée (with lantern illustrations): Professor ANGELO HEILPRIN.

The Mammalian Fauna of the Fort Union Beds: Mr. M. S. FARR.

The Marsupial Fauna of the Santa Cruz Beds: WM. J. SINCLAIR, Princeton, N. J.

The paper presents some of the more important results of a study of the marsupials of the Santa Cruz formation of Patagonia, which will be treated monographically in the forthcoming Volume VII. of the reports of the 'Princeton University Expeditions to Patagonia.'

The large Santa Cruz carnivores are shown to be true marsupials, belonging to the same family as the Tasmanian wolf *Thylacinus.* The suborder Sparassodonta is proved to have been based on a mistaken assumption. Certain small forms comparable in size to the South American opossums are included in the family Didelphyidæ, but are not regarded as prototypal to any of the existing opossums. A new family is proposed for reception of the Santa Cruz diprotodonts, the most primitive members of which are shown to be transitional to the Polyprotodontia. The descent from common ancestors of certain Australian, Tasmanian and South American types is suggested, and its bearing on paleogeography briefly discussed.

The Mutual Affinities of the Species of the Genus Cambarus: A. E. ORTMANN, of Pittsburg.

The Faunal Relations of the Ryu-kyu (Loo Choo) Islands: Dr. HENRY A. PILSBREY.

Evening Session—8 O'clock.

At the Free Museum of Science and Art, University of Pennsylvania, President Smith in the chair.

Reason and Intelligence vs. Custom and Habit in the Nutrition of the Body (illustrated by lantern slides): PROFESSOR RUSSELL H. CHITTENDEN.

A reception was given at nine o'clock in the museum by the president and council to the members of the society and the ladies accompanying them.

FRIDAY, APRIL 14.

Morning Session—10:30 O'clock.

Vice-President Newcomb in the chair.

The Secular Perturbations of the Earth: MR. ERIC DOOLITTLE.

It is well known that the earth and all of the other planets move about the sun in almost circular curves called ellipses. But the size and shape of the path in which any one planet moves are constantly changing

on account of the disturbing pull of all of the other planets. In order to predict the position of any planet, or of the sun for use in surveying and navigation, at any future time, these minute changes in the form and position of the orbits must be rigorously calculated and allowed for. One method of doing this is by obtaining any variation in the form of an infinite series, and then adding together as many terms of this series as are thought to be necessary. The computations in the great work of Le Verrier and Newcomb were performed in this way.

The German mathematician, Gauss, has proved, however, that those variations of the orbit of any body which increase indefinitely with the time will be precisely the same as the variations produced, not by the pull of the other planets, but by the pull of a series of elliptic rings which respectively coincide with the orbits of these disturbing planets. The mathematical computation of the effect of the pull of these rings on the orbit of the disturbed planet leads to a definite integral instead of to an infinite series.

The present paper gives the results of this computation as applied to the orbit of the earth. It is part of a work on which the author is engaged, which, when completed, will give the computation for each of the four inner planets.

On the Problem of Four Bodies: Professor Edgar Odell Lovett, of Princeton.

Radio-Activity in Solar Phenomena: Professor Monroe B. Snyder, of Philadelphia.

Evidence Relating to Latitude Variations of Short Periods. From Observations at the Flower Observatory During the Year 1904: Professor C. L. Doolittle, of Philadelphia.

Enquiry into the Pressure and Rainfall Conditions of the Trades-Monsoon Area: W. L. Dallas, of the Meteorological Office, India. (Presented by Professor Abbe.)

Mr. W. L. Dallas, who has been prominent for twenty years past as the first assistant in the office of the 'Meteorological Reporter to the Government of India' communicated 'An Enquiry into the Pressure and Rainfall Conditions of the Trades-Monsoon Area.' This is a contribution to the great problem of predicting the character of the approaching crop season and the crop itself. In India the crop depends on the rains of the southwest monsoon. After they have ended the crop ripens and the harvest comes before the dry season is under way. Formerly we thought of the southwest monsoon as a northeast trade-wind from the north Indian Ocean diverted toward the warm interior of Asia and the slopes of the Himalayas. But the Indian meteorologists, by studying the reports of winds from the Indian Ocean have succeeded in demonstrating that the southwest monsoon comes across the equator and is with the southeast trade-wind of the southern Indian Ocean drawn towards India and Siam and China. The intensity and direction depend upon the distribution of barometric pressure from the Himalayas, south to Cape of Good Hope on the west and to Australia on the east. In fact, the great area of land that we divide up into three continents of Europe, Asia, Africa, act as one warm area, the great dry land hemisphere, to disturb the action of the great water hemisphere. The dry land and the aqueous hemispheres of our globe by their annual warming and cooling powerfully affect the general circulation of the atmosphere, transforming it into an attempt at a huge whirl around the continent in opposite directions in summer and winter.

In this transformation a large fraction of our whole atmosphere is involved; the general conditions of the air as to temperature, moisture, pressure and wind in distant regions affect this Asiatic whirl and it itself affects other distant regions. The monsoon rains of India depend on the intensity of the winds, the moisture of the air and the exact direction in which and date on which it moves over the country. It may, therefore, be said to depend mainly on the distribution of atmospheric pressure over an immense area, perhaps one third of the surface of the globe. But it may also depend ultimately on the intensity and quality of the radiation that we received from the sun, since that may exaggerate the difference of temperature over land and water or over equatorial and polar regions and thus cause slight deflections in the general currents of air. A relatively small disturbing cause may cause a deflection that will turn the southwest monsoon aside and cause it to pass by or over India or fall short of reaching it and thus cause a failure of the monsoon rains and of the crops that depend on them.

On the Construction of Isobaric Charts for Upper Levels and their Dynamic Importance in Dynamic Meteorology: Dr. J. W. SANDSTRÖM, of Stockholm. (Presented by Professor Abbe.)

Dr. J. W. Sandström, of Stockholm, has long been a student of the atmosphere under the guidance of Professor Victor Bjerknes, of Stockholm, Sweden, and his eminent father the late Professor C. A. Bjerknes, of Christiania, Norway. These mathematicians have developed Kelvin's theorem of circulation within a fluid mass and have shown how to apply it to the earth's atmosphere, provided we have accurate values of the temperatures and pressures at various altitudes. To their work Dr. Sandström now adds an important practical consideration, *i. e.*, that the study of the motions of the upper atmosphere can best be made by drawing isobars and isotherms on successive level surfaces of equal gravity rather than on surfaces of equal height above mean sea level, as has hitherto been customary. In his memoir 'On the Construction of Isobaric Charts for Upper Levels and their Dynamic Importance in Dynamic Meteorology' Sandström gives formulæ and tables for this method of study and shows its advantages. It affords a peculiarly powerful method of utilizing the observations made at the seventeen kite stations occupied by the U. S. Weather Bureau in 1898, and his illustrative computations refer especially to these observations, as they were the first ever made that spread over so large area of country as to make it worth while to develop a method that is peculiarly suitable to them. At present this method also finds its most important application in studying the international aerial work now carried on by simultaneous ascensions to great heights once or twice monthly in Europe at fourteen balloon stations, seven kite stations, combined with twenty-five mountain-top stations and thirty-five or forty cloud or nephoscope stations. In this work the only American station at present contributing is the Blue Hill Observatory, but it is hoped that the U. S. Weather Bureau will eventually join in the great undertaking.

On the Straight-line Concept: Professor F. A. LAMBERT, of Bethlehem, Pa.

Precision is given to the straight-line concept not by experience or experiment, but by assumptions or axioms. These assumptions determine whether the straight line is that of the space of Euclid, of Lobatschefski or of Riemann. Cayley's theory of measurement causes much of the apparent mystery of these three spaces to vanish.

The geometry of Euclid does not require the straight line to be continuous.

At the annual election, which occurred at 12:30 o'clock, the following persons were chosen members:

RESIDENTS OF THE UNITED STATES.

Joseph S. Ames, Ph.D., Baltimore. Professor of physics in Johns Hopkins University; honorary member of the Royal Institution of Great Britain; member of the French Physical Society; author of 'Theory of Physics,' 'Manual of Experimental Physics,' 'Elements of Physics,' 'The Free Expansion of Gases,' 'Prismatic Diffractive Spectra,' 'Induction of Electric Currents'; assistant editor of *Astrophysical Journal* and associate editor of *American Journal of Science*.

Thomas Chrowder Chamberlin, Ph.D., LL.D., Chicago. Head professor of geology in University of Chicago; president of University of Wisconsin, 1887–92; in charge of glacial division of U. S. Geological Survey since 1882; geologist of Peary Relief Expedition, 1894; member of National Academy of Sciences; editor of *Journal of Geology;* author of 'Geology of Wisconsin,' 'Text-book of Geology,' etc., and of numerous papers relating to geology.

William Gilson Farlow, Cambridge. Professor of cryptogamic botany in Harvard University; author of 'Marine Algae of New England,' 'The Black Knot,' 'The Gymnosporangia of the United States,' 'The Potato Rot,' 'Index of Fungi,' 'Diseases of the Orange and Olive Trees,' etc., etc.; late president of the American Association for the Advancement of Science; member of the National Academy of Science and of the American Academy of Arts and Sciences.

Charles H. Frazier, M.D., Philadelphia. Dean of the medical department of the University of Pennsylvania and assistant professor of surgery; editor of the *University Medical Journal* and author of numerous monographs on surgical subjects.

David Starr Jordan, Stanford University, Cal. President of Leland Stanford University; author of 'Manual of Vertebrate Animals of Northern United States,' 'Fishes of North and Middle America,' 'Footnotes to Evolution,' 'Animal Forms,' 'Food and Game Fishes of North America,' 'A Guide to the Study of Fishes,' and numerous papers on ichthyology in proceedings of various societies and government bureaus; president of the California Academy of Sciences, 1896–98.

George Lyman Kittridge, LL.D., Cambridge. Professor of English in Harvard University; member of the American Philological Association and of the American Antiquarian Society and fellow of the American Academy of Arts and Sciences; has made valuable contributions to the study of Chaucer; author in collaboration with Professor Greenough of 'Words and Their Ways in English Speech,' and of numerous contributions to technical periodicals.

Robert G. Le Conte, M.D., Philadelphia. Surgeon to the Pennsylvania Hospital; adjunct professor of surgery and trustee of the University of Pennsylvania; late surgeon-general of the National Guard of Pennsylvania; author of a number of valuable contributions to surgical literature.

Eliakim Hastings Moore, Chicago. Head professor of mathematics at University of Chicago; president of the American Mathematical Society; associate fellow of the American Academy of Arts and Sciences; member of the National Academy of Sciences; editor of the *Transactions of the American Mathematical Society;* author of valuable contributions to mathematical science.

George T. Moore, Ph.D., Washington. Pathologist and algologist in charge of Laboratory of plant physiology, Bureau of Plant Industry, U. S. Department of Agriculture; author of papers on 'Soil Inoculation for Legumes,' 'A Method of Destroying or Preventing the Growth of Algae and Certain Pathogenic Bacteria in Water Supplies,' 'New or Little-known Unicellular Algae,' etc.

Richard A. F. Penrose, Jr., Ph.D., Philadelphia. Geologist and mining engineer; geologist in charge of survey of eastern Texas for Texas Geological Survey. Professor of economic geology, University of Chicago, 1892; special geologist, U. S. Geological Survey, 1894, to examine gold districts of Cripple Creek, Col.; fellow of Geological Society of America; member of Institute of Mining Engineers; National Geographical Society, etc.; author of numerous papers on economic geology.

Francis P. Venable, Ph.D., LL.D., Chapel Hill, N. C. President of the University of North Carolina; co-author of 'Inorganic Chemistry according to Periodic Law'; author of 'Development of Periodic Law' and of a 'Short History of Chemistry' and of numerous papers on inorganic chemistry; member of American Chemical Society, German Chemical Society; fellow of London Chemical Society.

J. Edward Whitfield, Philadelphia. Chemist, analytical and engineering; from 1880 to 1889 was connected with the U. S. Geological Survey as mineralogical chemist; author of analyses of

ores and of Western Coals for Northern Transcontinental Survey, published in Tenth U. S. Census, and of numerous articles in the *American Chemical Journal, American Journal of Science* and *Journal of American Chemical Society.*

Bailey Willis, E.M., C.E., Washington. Geologist; in charge of the stratigraphic geology department of the U. S. Geological Survey, and is specially charged with the preparation of a geological map of the United States; in 1903–04 he journeyed through Siberia and China under the auspices of the Carnegie Institution to study the geological history of those countries in comparison with that of North America, and is about to extend his studies of mountain growth, etc., to some of the European ranges.

FOREIGN RESIDENTS.

Yves Delage, Paris. Professor of zoology and comparative anatomy at the Sorbonne; editor of *L'Année Biologique;* author of 'La Structure du Protoplasme et les Théories sur l'Hérédité,' Paris, 1895, and of numerous contributions to biology; member of the Institute of France.

Otto Nordenskjold, Stockholm. Eminent geographer and geologist; commanded Swedish Scientific Expedition to West Antarctica in 1901–1903; explored south and east coasts of Palmer Land, Danco Land and King Oscar Land, and has made numerous valuable contributions to knowledge in geography, geology, paleontology and meteorology. Author of 'Antarctic, två är bland Sydpolens isar,' published at Stockholm, and of many papers in the *Geographical Journal, La Geographie* and other scientific publications.

William Matthew Flinders Petrie, D.C.L., LL.D., F.R.S., London. Professor of Egyptology in University College, London; has made extensive excavations in Egypt and numerous important contributions to Egyptian archeology; author of 'Pyramids and Temples of Gizeh (1883), 'Tanis' (2 vols., 1888–89), 'Naukratis' (1886), 'History of Egypt' (1894–96), 'Abydos' (2 vols., 1901–02), etc.

Edward Sievers, Leipzig. Professor of the German language and literature in the University of Leipzig; an eminent authority in phonetics, text criticism and meters; author of 'Angelsachsische Grammatik,' 'Phonetik,' 'Altgermanische Metrik,' and of many other monographs.

Sir William Turner Thiselton-Dyer, LL.D., Ph.D., F.R.S., Kew, England. Eminent botanist; director of Royal Botanic Gardens; botanical adviser to the Secretary of State for the Colonies, and has contributed very largely to the development of the botanico-economic resources of the British Empire; editor of 'Flora Capensis' and of 'Flora of Tropical Africa.'

Afternoon Session—2:30 O'clock.

President Smith in the chair.

The Theory of the Double Suspension Pendulum: Professor R. S. WOODWARD.

The double suspension pendulum is an apparatus for determining the acceleration of gravity. It consists of a massive rectangular bar, which is held rigidly and horizontally, and from which is suspended a similar bar by means of two parallel steel tapes of equal length. These tapes pass through the bars and are clamped rigidly to them. The tapes may thus be regarded as elastic beams built in at both ends. The suspended bar vibrates longitudinally by reason of its weight and by reason of the elastic bending of the tapes. Measurements with the apparatus require observations of the time of vibration of the suspended bar and the lengths of the suspending tapes. This form of pendulum avoids entirely the difficulties of the knife edges of ordinary pendulums and has the additional advantage of superior steadiness arising from the large vibrating mass. The paper outlines the mathematical theory of the motions of such a pendulum.

The Relation Between the Economic Depth for Bridge Truss and the Depth which Gives Greatest Stiffness: Professor MANSFIELD MERRIMAN, of Bethlehem, Pa.

The paper was read by the author. He explained that the increase in the depth of bridge trusses which has been going on for the past fifty years was due to considerations of economy and showed that there is a certain depth which gives the minimum amount of material. With respect to deflection under the passage of a train, it has generally been supposed that this continually decreased as the depth of the truss increased, but the author presented a proof

that this is not the case. The deflection decreases with increase in depth up to a certain point and beyond that it increases. The computations of Professor Merriman indicate that the depth of truss which gives the least deflection or the greatest stiffness is a little less than the economic depth. He also showed that the relation between the economic depth and the span of the bridge applies very closely to the depth which gives the greatest stiffness.

On the Dispersion, Absorption, Fluorescence and Magnetic Rotation of Sodium Vapor: Professor Robert Williams Wood, of Baltimore.

A Photographic Study of the Diffusion of Ultra-Violet Light by Gas Particles: Professor Robert Williams Wood, of Baltimore.

On the Use of the Falling Plate Oscillograph as a Phasemeter: Dr. William McClellan, of Philadelphia.

The three general methods for obtaining the form of an alternating current wave are—by means of contact-maker and meter, by means of a curve-tracer and by means of an oscillograph. With the first and second methods the current must be kept absolutely constant, as some time is necessary to take the numerous readings required to plot the curve. The oscillograph gives a picture of a single wave. Essentially it is a sensitive moving-coil mirror galvanometer, with a period of about one ten-thousandth of a second. It is able, therefore, to follow easily currents of commercial frequency. To obtain the wave form it is necessary to have a uniform motion perpendicular to the motion of the coil. This is obtained by synchronous motors, revolving films or a falling photographic plate. The latter has been found to be very convenient, though its motion is uniformly accelerated instead of uniform. The error is small, however.

With a double oscillograph, that is one that can draw two curves simultaneously, for example the current and voltage waves of a single circuit, we can immediately see the possibility of a phasemeter. To test the accuracy of the instrument when used in this way, an Ayrton and Perry standard of self-induction, of known resistance, was used. Current and electromotive force waves were obtained and the angle of lag measured. These were compared with the values calculated from the constants of the standard.

On the Brains of Scymnus, Mitsukurina and Chlamydoselachus, with Remarks upon Selachian Brains from Standpoints Morphic, Ontogenic, Taxonomic, Phylogenic and Pedagogic: Professor Burt G. Wilder, of Ithaca.

Of the three sharks named in the title all occur in Japanese waters. *Mitsukurina* (which may be called the 'rostrum shark' from the extraordinary projection of the snout separated from the upper jaw by a deep notch) was first described in 1898 by Jordan and has not, as yet, been found elsewhere; it is so remarkable, and the examples already obtained are so few that the specimen exhibited cost about $75.00 So far as the speaker is aware its brain has never before been studied. *Chlamydoselachus* is also very rare, but besides the Japanese specimens at least one has been taken off Madeira. It was described in 1884 by Garman, who suggested 'frilled shark' as a popular name, referring to the folded covers of the gill-slits, of which there are six instead of five as with most modern sharks. The body is so long and snake-like that Garman gave it the specific name *anguineus,* and perhaps a good popular title might be the English form, anguin; it has even been thought by some that

particularly large examples may have given color to the belief in the 'sea-serpent.' Garman's example was ill-preserved and the brain obviously in poor condition; the Cornell specimen is quite perfect. *Scymnus* has been long known; it is a rather ordinary-looking shark and occurs also in the Mediterranean, but it seems not to be very common, at any rate Professor Wilder has been unable to obtain a well-preserved specimen, and only recently has obtained a brain through the generosity of Professor Locy, of the Northwestern University.

Professor Wilder's special reason for studying the brain of *Scymnus* has been his wish to confirm or correct the account given in 1882 by the late T. Jeffery Parker, of New Zealand. According to this writer *Scymnus* 'exemplifies with diagrammatic clearness the typical structure of the vertebrate brain.' Professor Wilder finds that it really resembles more nearly the brain of *Heptanchus* and the earlier figures of Busch and Maclay; and this was to be expected since *Scymnus* is not, as to its other structures and its extinct relatives, such a very primitive type. But the simple conditions ascribed by Parker to *Scymnus* are more closely embodied in the anguin or frilled shark, whose cladodont relatives were in the Devonian epoch and which Garman regards 'the oldest [known] living type of vertebrate.' Here the walls of the forebrain are thinner and less differentiated, and in the lateral extensions toward the olfactory cups ('nostrils') the so-called cerebral portion expands nearly equally in every direction from the axis represented by the olfactory cruss; in most other sharks and in rays or skates the special cerebral extension is toward the meson or middle line, so as to meet the corresponding part of the other side; in the lamprey the cerebral extensions are away from the meson; in the Dipnoi, as shown by the speaker in 1887, they are downward, while in the ordinary and higher air-breathing vertebrates, reptiles, birds and mammals, the cerebral hemispheres expand mostly upward. It is as if nature had experimented in the four directions at right angles with one another from the primitive condition, nearly as in *Chlamydoselachus,* where the extension is almost uniformly in all directions from the olfactory axis. There were shown diagrams illustrating this idea, and also the possible derivation of the several grades of shark and ray brains from the hypothetic stem form, probably extinct and now inferred only from the embryonic conditions of recent forms. In this connection the speaker reiterated his previously expressed conviction that in evolution the olfactory portion of the brain had preceded the cerebral; that the ancestral vertebrates needed to smell rather than to think; that the organ of forethought had been, so to speak, an afterthought, and that the cerebral region, so preponderant in man, was rather an offshoot from the olfactory region, and had been interpolated between that and the hinder portions of the brain. The primitive preeminence of olfaction he regards as supported by the recent observations of Locy and others upon a nerve in most (probably all) sharks and rays and in some other generalized forms, connecting the nasal mucosa with the very front of the brain, and so slender as to have been commonly overlooked; in *Mitsukurina,* where the olfactory crura are extremely long, the nerve has been most skillfully worked out by Locy, to whom the Cornell brain was sent for the purpose. Although, from its late discovery, sometimes called the 'new nerve,' Professor Wilder thinks, perhaps, it is the very oldest; as suggested by Locy, its functions have been replaced by others,

and it has become vistigial in the generalized vertebrates, having disappeared altogether in the higher. The speaker commended Locy's paper as a model research, displaying the 'five Cs,' clear, consistent, correct, concise and, so far as possible, complete.

Professor Wilder has long held that the very difficulties of neurology demand its early cultivation and that the elements of this most abstruse natural science, like those of astronomy, should be taught objectively in the primary schools. After trying various forms he concludes that the required pedagogic conditions are best met by the sharks and rays, particularly in respect to the ease with which they may now be had from the supply departments of the numerous marine laboratories; he believed it especially desirable that the beginner should himself lay bare the specimen so as to feel toward it an actual sense of ownership like that of a discoverer. Since the skulls of these fish are of cartilage, the brain can be exposed with the simplest instruments, even a jack-knife, better a small shoe-knife cut off obliquely.

In concluding Professor Wilder declared that the greatest mistake of his scientific life occurred while working on these sharks and rays in 1866–68 for the late Professor Louis Agassiz; he persisted in devoting himself to less noble and significant structures, notwithstanding the gently expressed preference of his too considerate employer. Since 1873 he has lost no opportunity of preparing and dissecting selachian brains, and hopes the present paper may arouse interest in them and lead to the recognition and elucidation of the numerous and complex problems connected with them.

The final event of this most successful meeting was a dinner at the Bellevue-Stratford on Friday evening. On this occasion Professor Edgar F. Smith, president of the society, acted as toastmaster. Addresses were made by President Smith; Dr. Woodrow Wilson, president of Princeton University, who responded to the toast 'The Memory of Franklin'; Dr. Woodward, president of the Carnegie Institution; Dr. H. W. Wiley, of Washington; Professor W. B. Scott, of Princeton, and Professor W. T. Hewett, of Cornell.

SCIENTIFIC BOOKS.

The Whalebone Whales of the Western North Atlantic, compared with those occurring in European Waters, with some observations on the species of the North Pacific. By Frederick W. True. City of Washington, published by the Smithsonian Institution. 1904. Pp. viii + 332; 97 text figures; 50 plates.

Those who are acquainted with the imperfect condition of our knowledge of whales, and particularly of the larger species, with the consequent multiplication of species and genera, will appreciate this memoir as well as realize the labor involved in its preparation. The objects of the work are to definitely decide the specific identity or difference of the species of whales occurring on the coast of Europe and America and to locate and identify the specimens on which the American species were based. These problems proved to be so involved that the subject of the distribution and migrations of the larger cetacea, which first led Mr. True to study the whales, had to be postponed.

That the synonymy of the larger cetacea should be involved is not surprising; owing to the practical impossibility of systematically collecting such animals, the greater part of the species are founded upon specimens, often fragmentary, that have accidentally come to hand, with the result that observations have been desultory and disconnected.

The first chapter of Dr. True's memoir is devoted to 'The Earliest References to Whalebone Whales in American Waters,' and this is full of information and interest to both naturalist and general reader, since it con-

tains much information as to the extent and methods of the early whale fisheries on the eastern coast of North America. We learn that at a very early date (by the middle of the sixteenth century) there was a regularly established whale fishery on the coast of Newfoundland, while it is rather saddening to see how abundant were whales in those early days. Surely if the killing of whales has any direct or serious effect on any other fishery this effect must have been felt many years ago.

Chapter two is 'A Chronological Account of Important Contributions to the Natural History of North American Whalebone Whales' and in it, under date of 1741, we have the first systematic summary of the then known or recognized American species, in which some of them appear under the common English names by which they are yet known. It is a striking commentary on the lack of knowledge, or rather the large amount of misinformation, regarding whales, to note that this list is quite as understandable, and decidedly more accurate, than Gray's synopsis published in 1871.

This leads naturally to 'A Review of Cope's and Scammon's Species,' in which the species of the Atlantic coast are ruthlessly slaughtered, while later on doubt is cast on the specific identity of the larger Pacific whales which may prove to be identical with those of the Atlantic.

Chapters four to eight contain a systematic review, with many details as to measurements and coloration, of the finback, sulphurbottom, little piked whale, humpback and North Atlantic right whale, abundant comparisons being made with the work of other writers. Here we get what we actually know regarding the size, proportions and coloration of these great animals, and before passing to the conclusions deduced from them it may be worth while to note one or two points about the sulphurbottom, which is the largest of vertebrates. By the courtesy of Mr. Pike and Captain Bull, of the Cabot Company, it is possible to supply the measurements of the flukes, which Dr. True was unable to obtain, and to say that in males respectively 74 feet 8 inches and 74 feet 4 inches from fluke notch to tip of nose they were 16 feet 5 inches and 17 feet 2 inches in greatest spread. Various measurements of sulphurbottoms taken in 1903 agree with those taken by Dr. True, save that one female measured by him attained a length of 77 feet, or two feet more than any animal seen in 1903. As to the specimens noted abroad as having lengths of from 90 to 100 feet the reviewer frankly states his disbelief in their existence, though willing to grant that some giant may now and then reach a length over all, from tip of flukes to underhang of lower law, of 90 feet.

That the measurements of whales taken on the Norway coast should decidedly exceed those taken elsewhere is rather strange, and though it is barely possible that the largest animals occur there, the reviewer pleads guilty to a desire to measure one such animal himself, the more that it has never fallen to his lot to measure any animal that came up to the standard of size set by others. It is regrettable that the one measurement of a whale, from tip of nose to eye, that can be taken with certainty, is no safe criterion of the size of the animal, since the comparative length of the head is so extremely variable that there may be a difference of nearly a foot in this respect between two animals of equal length.

This naturally lessens the value of any ratios that may be made between the proportions of two whales. It is both interesting and discouraging to see how measurements of whales vary, but a part of the discrepancies shown may be explained by the difficulty commonly experienced in measuring cetaceans, while others are due to a failure to state how certain measurements were taken. This may possibly explain why Dr. True finds the flukes of the Newfoundland humpbacks wider than in European specimens, quoting 15 feet 8 inches and 17 feet 2 inches for whales respectively 42 and 45 feet long. A very accurate measure of the flukes of a humpback 50 feet long, following the curve of the back, gave a spread of only 13 feet 8 inches. It is also probable that the flukes show a great range of variation, as do the flippers.

Chapter ten gives the conclusions based on

Dr. True's studies, and these are that several American species which have been proposed are quite nominal and that, as a whole, the species of the Atlantic coast of North America can not be distinguished from those of European waters. Further, the whales of the Pacific coast, with the exception of the gray whale, bear an extremely close resemblance to those of the Atlantic, although at present material is not available to definitely determine whether or not they are specifically identical.

The eastern species admitted by Dr. True are the finback, *Balænoptera physalus* (Linn.); sulphurbottom, *B. musculus* (Linn.); little piked whale, *B. acuto-rostrata* Lacépède; pollack whale, *B. borealis* Lesson; humpback, *Megaptera nodosa* (Bonnaterre) and North Atlantic right whale, *Balæna glacialis* Bonnaterre. These scientific names are those recognized after a careful study of the literature and are practically those adopted in Dr. True's paper of 1898, since he noted that *M. nodosa* had been applied to the American humpback prior to the use of *M. longimana* for that taken on the European coast.

It is certainly a relief to see the species of cetacea rescued from the maze of synonymy in which they have for many years been involved, and if any one is so unfortunate as to come upon some unique work that would change any of the above names it is to be hoped that he will promptly destroy it and thus earn the gratitude of posterity.

The fifty plates, with from two to four figures on a plate, are devoted to reproductions from photographs of crania and other important parts of the skeletons, and many views of stranded whales and whales lying on the slips at whaling stations. The index is one that not even the *Nation* can criticize and Mr. True is to be congratulated upon the successful completion of a long and difficult piece of work. F. A. L.

TWO RECENT MOSS BOOKS.

Dr. A. J. Grout has just published a second edition of 'Mosses with a Hand-Lens,'* which includes also some of the more common hepatics. The new edition, which follows the same general plan as the first edition, is expanded, to included 169 of the 'more common and more easily recognized mosses of the northeastern United States,' as well as fifty-four of the hepaticæ of the same region.

The descriptions are non-technical, and only such characters are employed as, according to the experience of the author, can be determined by the use of a powerful hand-lens. The key to the families of mosses is followed by a *brief* introduction and a *short* consideration of the life history and general structure of mosses. The last topic could be somewhat expanded with profit to the student. The text contains something like 118 figures and 39 full-page plates, the latter reproductions very largely from the Bryologia Europæa, which is a sufficient guarantee of their excellence. Many of the figures are rather lacking in clearness of detail, but in the matter of typography and illustrations, the work is so much of an improvement over its predecessor that it deserves special commendation.

To those who are without the advantages of a compound microscope and can not afford the author's more complete book, 'Mosses with Hand-Lens and Microscope,' this little volume will prove a valuable aid. If it serves as a stimulus to a more detailed study of this very interesting group of plants, its existence will be justified.

Many students of mosses will probably welcome the appearance of 'Moose' by Dr. W. Migula.* Although the work is primarily intended for German students, it contains much that will be valuable for American students, and its reasonable price places it within the reach of all.

The first chapter deals with the structure of the moss-plant, and the general features of

* 'Mosses with a Hand-Lens.' Second edition with Hepatics, pp. xvi + 208. March, 1905. $1.75. Published by the author, 306 Lenox Road, Flatbush, Borough of Brooklyn, New York City. Also O. T. Louis Co., 59 Fifth Ave., New York City.

* Band I. 'Moose,' in Band V. of Professor Dr. Thome's 'Flora von Deutschland, Oesterreich, und der Schweiz.' Pp. vi + 512. 19 M. 1904. Friedrich von Zezschwitz. Gera, R.

taxonomic importance are clearly elucidated. Brief directions are then given for the collection of material and the determination of species, and this is followed by the taxonomic section which includes quite detailed descriptions of 916 species of mosses, with dichotomous keys to the families, genera and species. The system of classification adopted agrees very closely with that of Limpricht in Rabenhorst's 'Kryptogamen Flora von Deutschland.'

The second part of the work deals with the liverworts and in general arrangement follows that for the mosses. Keys and descriptions are given for 228 species. The work is bound in 'halbfranz,' and is embellished with 68 full-page lithographed plates, distributed throughout the text, of which 26 are executed in natural colors. The work is on the whole an admirable one, and it is only to be regretted that the production of such works is apparently not possible in our own country. It will form a valuable addition to the library of any student of mosses.

F. D. HEALD.

THE UNIVERSITY OF NEBRASKA.

SCIENTIFIC JOURNALS AND ARTICLES.

THE contents of the March issue of *Terrestrial Magnetism and Atmospheric Electricity* is as follows:

Portrait of Svante August Arrhenius, Frontispiece.

S. A. ARRHENIUS: 'On the Electric Charge of the Sun.'

C. CHREE: 'Review of Maunder's Recent Investigations on the Cause of Magnetic Disturbances.'

W. VAN BEMMELEN: 'Magnetic Survey of the Dutch East Indies.' (Third communication.)

J. ELSTER und H. GEITEL: 'Vorschläge für die Ausführung electrischer Beobachtungen während der bevorstehenden Sonnenfinsterniss.'

L. A. BAUER: 'Proposed Magnetic and Electric Observations during the Total Solar Eclipse of August 30, 1905' (Preliminary Information).

J. E. BURBANK: 'Earth Currents: and a Proposed Method for their Investigation.'

Biographical Sketch of Svante August Arrhenius.

Letters to Editor: Nachtrag zur Abhandlung 'Ueber den Einfluss der Torsion bei den Ablenkungen eines hängenden Magneten,' F. Bidlingmaier; Tortosa Observatorio del Ebro (Illustrated), R. Cirera; Principal Magnetic Disturbances recorded at Cheltenham Magnetic Observatory, December 1, 1904, to March 1, 1905, W. F. Wallis; Present Russian Magnetic Observatories, M. Rykatscheff.

SOCIETIES AND ACADEMIES.

THE AMERICAN PHYSICAL SOCIETY.

THE regular spring meeting of the Physical Society was held at the Ryerson Physical Laboratory of the University of Chicago on Friday, April 21, and Saturday, April 22, 1905. President Barus presided. The meeting was well attended, nearly all the colleges and universities within several hundred miles of Chicago being well represented. An informal dinner on Friday evening at the Quadrangle Club was a pleasant feature of the meeting. The program, which was the largest in the history of the society, is given below:

H. N. MCCOY, University of Chicago: 'On the Relation between the Radioactivity and Composition of Uranium Compounds.'

G. G. BECKNELL, Northwestern University: 'The Residual e.m.f. of the Carbon Arc.'

C. W. CHAMBERLAIN, Denison University: 'The Radius of Molecular Attraction.'

G. M. HOBBS, University of Chicago: 'The Relation between p. d. and Spark Length for Small Values of the Latter.'

CARL KINSLEY, University of Chicago: 'Short Spark Discharges.'

J. E. ALMY, University of Nebraska: 'The Influence of Electrodes upon Spark Potentials.'

J. E. ALMY, University of Nebraska: 'Note on the Potential Difference Required to Produce very Short Sparks.'

A. B. PORTER, Chicago: 'Some Oddities in Lenses.'

A. H. TAYLOR, University of Wisconsin: 'On the Possible Variation of Inductance Standards with Temperature.'

E. M. TERRY, University of Wisconsin: 'On the Variation of Capacity with Temperature.'

A. H. TAYLOR, University of Wisconsin: 'On the Comparison of Mutual Inductances.'

R. T. HERDEGEN, University of Wisconsin: 'The Comparison of the Mutual Inductance of a Pair of Coils with the Self-induction of One of Them.'

O. M. STEWART, University of Missouri: 'The Use of the Quadrant Electrometer in Measuring Current.'

R. R. Ramsey, University of Indiana: 'Polarization of Standard Cells.'

Henry Crew and B. T. Spence, Northwestern University: 'Variation of Arc Spectra with the Phase of the Current Producing Them.'

A. A. Michelson, University of Chicago: 'Reciprocal Relations in Diffraction.'

A. A. Michelson, University of Chicago: 'Report of Progress in Ruling Diffraction Gratings.'

A. A. Michelson, University of Chicago: 'On the Use of the Concave Mirror with Diffraction Gratings.'

N. A. Kent, Wabash College: 'The Relative Positions of the Arc and Spark Lines in the Spectra of Titanium and Zinc.'

H. M. Reese, University of Missouri: 'The Resolving Power of Quartz Prisms.'

E. S. Johonnott, Rose Polytechnic Institute: 'The Black Spot in Thin Liquid Films.'

F. L. Bishop, Bradley Polytechnic Institute: 'Thermal Conductivities.'

A. P. Carmen, University of Illinois: 'The Collapse of Tubes by External Pressure.'

A. B. Porter, Chicago: 'Abbe's Diffraction Theory of Microscopic Vision.'

F. R. Watson, University of Illinois: 'Surface Tension by the Method of Liquid Jets.'

A. L. Foley and J. H. Haseman, University of Indiana: 'Diffraction Fringes of Electric Discharges and the Fluid Streams.'

L. T. More, University of Cincinnati: 'On Dielectric Strain Along the Lines of Force.'

J. E. Almy, University of Nebraska: 'On the Dielectric Strength of Crystals.'

Percival Lewis, University of California: 'The Velocity of Ions in Gases from Colored Flames.' (By title.)

L. R. Ingersoll, University of Wisconsin: 'The Kerr Effect in the Infra-Red Spectrum.'

E. L. Nichols and Ernest Merritt, Cornell University: 'The Phosphorescence of Sidot Blend.'

W. W. Coblentz, Cornell University: 'Infra-Red Emission Spectra of Gases in Vacuum Tubes.' (By title.)

D. B. Brace, University of Nebraska: 'Æther Drift and the Rotary Polarization Test.'

D. B. Brace, University of Nebraska: 'On a Test of Anomalous Dispersion by Means of Channeled Spectra.'

C. B. Thwing, Syracuse University: 'Experiments on the Flow of Electricity in Metals under Changes of Pressure.'

H. A. Clark, University of Nebraska: 'The Absorption and Refraction of Carbon.'

Ernest Merritt,
Secretary.

AMERICAN CHEMICAL SOCIETY.
NEW YORK SECTION.

The sixth regular meeting of the New York Section was held Friday, March 10, at 8:30 P.M., in the American Museum of Natural History, 78th Street and Central Park West.

The program of the evening was as follows:

The Vapor Friction of Isomeric Ethers: Morris Loeb and F. S. M. Pederson.

The recorded experiments on the friction of vapors, by the transpiration method, having been made with cumbersome apparatus and at the temperature corresponding to the boiling points of the substances, it was thought important to devise a method whereby non-saturated vapors could be studied at identical temperatures, for the purpose of ascertaining whether the constitution as well as the composition of organic compounds influences the molecular volume, of which the vapor-friction is a function.

The apparatus used consists of a U-tube, one limb of which, about 60 cm. long, has a bore of less than one tenth of a millimeter, while the bend and the other limb is just wide enough to allow a column of mercury to descend unbroken. A stop-cock and funnel-end are placed on the wider tube, which also bears two marks about 50 cm. apart. The capacity of the tube between these marks is accurately determined. The whole apparatus can be heated uniformly, as it is surrounded by a vapor-jacket. Before heating, the liquid to be studied is poured into the tube and is vaporized as the temperature rises, in such a manner as to expel all air and foreign gases. A short column of mercury, of known length is introduced by means of the stop-cock, and in its descent forces the vapor through the capillary; the time in which the lower meniscus travels from the upper to the lower mark is ascertained by means of a stop-watch. The method is easy and rapid, and experiments with air gave results agreeing well among themselves and with the values obtained by the majority of previous observers. The calculations were made according to Poiseulle's formula, very few corrections being necessary.

From the study of isomeric ethers, as well as ethyl alcohol, it was found that the consti-

tution has a decided influence upon the internal friction of the vapor, as will be seen from the following table, representing in each case the average of a number of experiments. The last column gives the comparative volumes of the molecules according to the formula suggested by L. Meyer, in which '*Y*' is the friction, '*M*' the molecular mass,

$$V = .00003 \left(\frac{M(1+aT)}{Y^2}\right)^{\frac{3}{4}}.$$

Substance.	Y.	V.
Methyl ether, $(CH_3)_2O$	1,133.5	55.53
Ethyl alcohol, C_2H_6O	1,100	58.09
Methyl-ethyl ether	1,030	78.2
Ethyl ether	944.7	110.4
Methyl-propyl ether	951.8	100.74
Methyl-isopropyl ether	992.3	96.46
Ethyl-propyl ether	874.9	133.2
Di-propyl ether	797.6	170.7
Di-isopropyl ether	841.5	157.8

The Iodine Absorption of Rosin and Shellac: A. C. LANGMUIR.

The paper states the results of further investigations in the iodine absorption of rosin and shellac. The various grades of rosin A. to W. W., ranged between 190.1 and 264.5 in the percentage of iodine absorbed. A number of pure shellacs of the years 1890 to 1895 were tested in order to find if there was any variation in different crops. The figures obtained were between 14.3 and 17.4 and are the same as those shown by similar grades to-day.

Decomposition of Ammonia at High Temperatures: WILLIAM MELVILLE and ALFRED H. WHITE.

The paper embodies the results of a series of experiments carried on in the chemical laboratory at the University of Michigan, by Mr. A. H. White, instructor in chemical technology, and Mr. Wm. Melville. The object of the experiments was to determine if possible the influence of surface contact upon the decomposition of ammonia, also the effect upon the decomposition, of mixing the ammonia with gases, which are generally present in the manufacture of illuminating gas, with a view to increasing the yield of ammonia in the manufacture of coal gas.

The results have been tabulated, and also plotted in the form of curves, showing the effect of increased temperature, rate of flow of gas, and dilution with hydrogen, nitrogen, carbon monoxide and water vapor.

Mineral Waters at the St. Louis Exposition: A. A. BRENEMAN.

The paper gave the experience and observations of the author as chairman of the International Jury on mineral waters at the St. Louis Exposition. He also drew some comparisons between the exhibition of 1904 and that at Chicago in 1893, where he filled a similar position.

Mineral waters at St. Louis were shown mainly in the departments of mines and metallurgy, a few only being in the agricultural building. The collection numbered about 160 samples. Notable among these was the collective exhibit of the U. S. Geological Survey embracing 125 samples of United States waters which are offered for sale, all neatly bottled and arranged on shelves and in a separate enclosure. Most of these were accompanied by analyses and descriptive circulars. Another feature of this exhibit was the illustration of the analysis of each water by a series of small jars containing powders which represented the proportion of the dry ingredients extracted from the waters, a demonstration which gave a much more tangible interpretation to the average visitor than the printed analyses.

The foreign exhibit was represented by Mexico, Brazil, Argentine and Peru, the last with an alkaline table water of exceptional merit. Mexico sent very good samples with alkaline and sulphureted waters. Germany, Hungary and Portugal monopolized the list from abroad with 8, 19 and 11 samples, respectively, while Belgium and Italy with one each completed the European list. These foreign waters deserve particular consideration because of their long transport and time of keeping, both tending to accentuate any defects. It would be difficult to find a fault in some of these samples as presented. Germany having the largest trade and greatest experience, rightly leads the list among these.

As compared with the exhibition of mineral waters at Chicago in 1893, the St. Louis display was smaller and had fewer countries represented, but was, on the whole, of better

quality. Russia and Spain, which were largely represented in the earlier display, were both absent in 1904. American waters especially show a great improvement over the earlier period. The trade as a whole, in the United States, has grown from 21,569,608 gallons, worth $3,211,846 in 1894, to 51,242,719 gallons, worth $9,041,078 in 1903.

Radium Exhibits at the St. Louis Exposition: George F. Kunz.

The radium exhibit of the U. S. Geological Survey at the St. Louis Exposition was gathered under the auspices of the author for two main purposes: (1) As this was an exposition year, such a collection shown at a great fair would mean the interesting of a great number of people in radio-activity—one of the newer problems of the hour; (2) by the exhibition of a collection of apparatus and of the minerals themselves, it would lead many people to look for these minerals in various sections of the country. Both these objects were accomplished to a greater or less extent; and it is believed that the coming year will bring more facts in this direction than we possess at present.

The radium exhibit of the U. S. Geological Survey was also exhibited by the American Museum of Natural History on March 10 in a large series of cases, for the New York Section of the American Chemical Society.

The seventh regular meeting of the section was held at the Chemists' Club, Friday evening, April 7. The program of the evening was as follows:

Polarimetric Analysis: F. D. Dodge.

In a brief paper the author discusses some of the applications of the polariscope in chemical analysis, and shows that, for quantitative work, its use has so far been practically limited to sugar and similar substances.

The varying specific rotation of most optically active compounds under different conditions of solution and temperature, the interference of unknown substances, and difficulties with colored solutions, are among the principal causes which have prevented a more extended use of the instrument.

A method is also described by which some analyses, difficult or inconvenient by ordinary methods, can be carried out quickly and with reasonable accuracy by means of the polarimeter.

Quinazolines from 2-Amino 6-Nitrobenzoic Acid: Victor J. Chambers and M. T. Bogert.

The authors show that quinazolines may be readily obtained: (1) By heating 2-amino 6-nitrobenzoic acid in sealed tubes with nitriles and acid anhydrides, (2) by heating the ammonium salt of 2-acylamino 6-nitrobenzoic acid, (3) by fusing 2-amino 6-nitrobenzoic acid with amides, or (4) by treating 6-nitro acylanthranils with primary amines. 2-acetylamino 6-nitrobenzoic acid, 6-nitro acetylanthranil, the quinazoline, its 2-methyl, 2-phenyl and various other derivatives are described. Only three nitro-quinazolines are known besides those described in this paper.

Homo-anthranilic-nitril and some of its Derivatives, 7-Methylquinazolines: A. Hoffman and M. T. Bogert.

Starting with homo-anthranilic nitril a series of the aliphatic and aromatic acyl derivatives were made. In the case of the aliphatic derivatives, molecular proportions of the fatty acid anhydrides and nitril were heated together. The aromatic derivatives were made by dissolving the acid chlorides and the nitril in separate portions of pyridine and the solutions mixed. The compounds prepared were the acetyl, propionyl, iso-butyryl, iso-valeryl, benzoyl, meta-nitro-benzoyl and para-nitro-benzoyl. The formyl derivative could not be obtained, as it immediately rearranges to the quinazoline.

By heating the acyl-homo-anthranitic nitril with alkaline hydrogen peroxide, 7-methyl-2-R-keto-dihydro-quinazolines were formed. This reaction works very smoothly and offers the advantage over the older methods that the homo-anthranitic nitril need not first be converted into the amide or the acid itself. The 7-methyl-keto-dihydro-quinazoline itself was made, and the following 2-R derivatives; methyl, ethyl, iso-propyl, iso-butyl, phenyl, meta-nitro-phenyl and para-nitro-phenyl.

Theories of Metabolism: GRAHAM LUSK.

A mass of living matter composing an individual produces in metabolism exactly the same quantity of energy (which may be measured as heat) as any other similar individual mass of the same size and shape in the same environment. The cause of the metabolism is not due to oxygen and oxidizing enzymes for these are present in excess. The cause is not due to the satisfaction of chemical equivalents (as in Ehrlich's side-chain theory of immunity) for the metabolism proceeds in accordance with the utilization of energy equivalents (isodynamic values). The swinging motions of the cell particles apparently act after the manner of catalysis, breaking up proteid, fat and the carbohydrates into simpler molecules, which may then unite with oxygen. The energy liberated through these chemical processes is in turn exactly sufficient to maintain those swinging motions of the cell particles whose aggregate we call life. After all is said, it is only possible to define metabolism as being due to unknown causes in the cells.

F. H. POUGH,
Secretary.

THE CORNELL SECTION OF THE AMERICAN CHEMICAL SOCIETY.

AT the March meeting of the Cornell Section of the American Chemical Society Mr. William W. Coblentz, Carnegie fellow, department of physics, Cornell University, read a paper on 'The Infra-red Emission and Absorption Spectra.' The speaker introduced his subject by showing several substances which emitted light, when heated slightly, while the iron plate containing the substance gave out no light. This shows the necessity of distinguishing between luminescence and a pure thermal radiation. After reviewing the ionic theory of emission and absorption spectra the speaker illustrated his researches on this subject by means of two series of lantern slides. The slides of emission spectra dealt with luminescent and pure thermal radiators, and comprised such radiators as the Nernst lamp, the acetylene and amylacetate flames, metals in the carbon arc, the spark discharge, the mercury arc and the vacuum tube radiation for different gases. The slides of absorption spectra dealt with compounds showing the following facts: isomeric compounds show that structure has a great influence upon the resulting absorption spectrum; that the maxima of absorption do not shift with increase in molecular weight; that the substitution of certain groups of atoms has a great influence upon the absorption spectrum; that the spectra of groups of compounds are similar and are characteristic of the grouping adopted by chemists; that carbohydrates have a characteristic spectrum; that several marked absorption bands are closely harmonic; that in compounds having water of crystallization certain absorption bands are coincident with those of ordinary water; that the CH_3 group has characteristic bands at 3.43 and 6.86, NH_3 at 2.96, OH at 3, NCS at 4.78, C_6H_6 at 3.25 and 6.75; and finally that in benzene derivations the original bands of benzene, C_6H_6, are found beside the new ones, e. g., those of CH_3, NH_2 or NCS, showing that the vibration of the benzene nucleus has not been destroyed.

AT the meeting on April 18, 1905, Dr. A. W. Browne read a paper on 'A New Synthesis of Hydronitric Acid.'

Previous methods for the formation of hydronitric acid (or its inorganic salts) from hydrazine or its inorganic derivatives have involved, respectively, the action of nitrous acid, potassium nitrite, silver nitrite, nitric acid or nitrogen trichloride; or of oxidizing agents (such as chromic acid or hydrogen peroxide) in presence of hydroxylamine chloride. In no case has the compound been formed by the action upon hydrazine alone of a substance containing no nitrogen.

The method now to be described consists in the action of hydrogen peroxide upon hydrazine sulphate in presence of strong sulphuric acid. In eleven experiments performed under varying conditions yields of from 11.4 to 28.4 per cent. of hydronitric acid were obtained. The reaction may be considered to proceed in accordance with the following equation:

$$3N_2H_4 + 5H_2O_2 = 2HN_3 + 10H_2O.$$

The identity of the hydronitric acid was

established by the following facts: (1) It possessed even in dilute solution the characteristic headache-producing odor; (2) when treated with ferric chloride solution it gave the usual blood-red color, destroyed by dilute hydrochloric acid and not destroyed by dilute mercuric chloride solution; (3) when treated with silver nitrate solution it gave a white precipitate completely soluble in dilute nitric acid. The dried precipitate exploded with violence when thrown upon a hot iron plate or when touched with a glowing platinum wire; (4) analyses of the silver salt showed it to be identical with silver trinitride.

Further experiments have shown that hydronitric acid may be obtained in small quantities by the action upon hydrazine sulphate of certain oxidizing agents other than hydrogen peroxide, some of which have been previously used by other investigators in the quantitative determination of hydrazine.

At a special meeting of the section held on May 2 at eight P.M., Dr. W. C. Geer, of the department of chemistry, Cornell University, read a very interesting paper entitled: 'The Chemistry of Indium.'

W. S. Lenk,
Secretary.

THE GEOLOGICAL SOCIETY OF WASHINGTON.

The 167th meeting was held at the Cosmos Club, April 12.

The following papers were given as the regular program:

Terraces of the High Sierra, California: G. K. Gilbert.

The Sierra Nevada has long been recognized as a broad, sloping plateau having a steep face toward the east and a gentle descent from its crest to the western base. The fact has also been recognized that the general plateau is made up of subsidiary plateaus. In the northern part of the range it has been shown by Diller and others that various subsidiary plateaus are separated from one another by faults, and their discrepancies in altitude were caused by differential uplift. At the extreme south, in the basin of Kern River, Lawson has ascribed certain subsidiary plateaus to erosion, the surface of the range having been partially graded during pauses between epochs of uplift. The present studies pertain to the higher portions of the range, from the Kern River basin northward to that of the Tuolumne, a distance of more than 100 miles. Within this belt are (1) *summit plateaus* characterizing interstream areas and recording a long period, or periods, of degradation soon after the commencement of the Sierra uplift. Many of the peaks overlooking the summit plateaus, especially in the neighborhood of the crest line, have (2) *remnant surfaces* of moderate slope, strongly contrasted with the surrounding cliffs, produced for the most part by glacial erosion. And many of the valleys are bordered by (3) *high terraces,* in some cases expanded so as to constitute important plateaus. It is believed that the remnants of old topography at high altitudes were in the main once continuous with the summit plateaus, but the correlation is difficult, because the connecting slopes have been destroyed by the excessive development of glacial cirques. It is probable also that some of the valley plateaus at high levels will eventually be correlated with summit plateaus farther to the west, and it is also to be anticipated that the plateaus and terraces of the higher parts of the range will eventually be correlated with similar features near the western base of the range; but the latter have not yet been studied. In the upper Tuolumne basin a discordance of plateau levels appears to have been produced by comparatively recent dislocation, and somewhat similar phenomena were observed in the basin of Kings River.

The plateaus constitute part of the evidence by means of which the history of the uplift is to be read, and they also serve as datum planes from which the amount of subsequent erosion, especially glacial erosion, can be measured.

The Snowy Range of New South Wales: W. Lindgren.

As is well known, the Australian Cordillera follows the eastern coast of the continent until, in Victoria, it bends westward and finally dies out.

The highest points of this cordillera are situated in the southern part of New South Wales, not far from the Victorian boundary line, and somewhat exceed 7,000 feet in elevation; the culminating point is Mt. Kosciusko, which attains 7,300 feet. The Snowy Range, which includes most of this elevated district, constitutes the watershed between the interior drainage of the Murrumbidgee and Murray Rivers and that of the Snowy River which empties into the ocean in Victoria near the boundary line between that state and New South Wales.

The plateau sustains a very scanty vegetation of dwarfed eucalyptus. The climate is very cold, the temperature sinking to — 20° F. in the winter, and the snowfall is extremely heavy.

The rocks consist chiefly of the rather closely folded Paleozoic sediments which occupy so much space in the Cordillera. Their age ranges from Ordovician to early Carboniferous, and tuffs and intrusive granitic rocks of various kinds are associated with the sediments.

The so-called Snowy Range is not really a range at all, but a plateau of comparatively gentle relief, a peneplain in fact, with elevation ranging from 5,000 to 7,000 feet, in which the Tumut, Murrumbidgee and Eucumbene Rivers have cut abrupt canyons, the depth of which in some cases amounts to 3,000 feet. That this uplift is of comparatively recent age is proved by the basaltic flows which, near Kiandra, cover the summit of the plateau. The basalt covers an old auriferous river channel which has been traced for 20 miles by means of mining operations, and which has a gentle northward grade. Sand, clay and lignite cover the thin stratum of auriferous gravel to a depth of 150 feet and capping this the basalt flow attains a thickness of about 100 feet.

GEO. OTIS SMITH,
Secretary.

DISCUSSION AND CORRESPONDENCE.

CONCERNING THE NATURAL MOUNDS.

WHAT has been said in SCIENCE recently (Nos. 530, 535 and 536, pp. 310, 514 and 551) by Mr. A. C. Veach and Professors Branner and Hilgard is of great interest to the writer, inasmuch as he has for some years been making observations on these mounds in Arkansas with the hope of reaching a satisfactory conclusion as to their origin. They have been observed along the western border of the Tertiary area, along the Arkansas valley, and in the northwestern part of the state. In outline, they are uniformly circular, and in size are rarely less than fifteen or more than thirty feet in diameter, and usually less than three feet in height.

The theories of surface erosion, wind origin and human origin have been applied to these with the conclusion that none of them will hold. The uniformity of size and circular outline could not result from surface erosion. For the same reason, as Mr. Veach points out, they could not be the product of wind deposition. Besides, they always occur on clay soil, out of which and upon which, according to the writer's observations, the wind does not form dunes. The fact that they frequently occur in the most undesirable places for human abode, being on ground where both the surface drainage and underdrainage is poor, is in itself sufficient argument against the theory of human origin. The spring and gas vent theory is not tenable in the Paleozoic region, for the reason that Mr. Veach has stated.

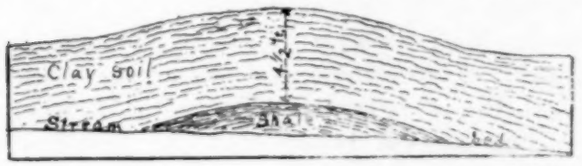
After being forced to abandon the above theories, one of origin by burrowing animals, such as the gopher or prairie-dog, was held for some time, but the examination of a large number of sections disclosed by grading along railroads, wagon roads and cutting ditches through farms furnished no evidence of the material having been worked over, as must have been the case if such were the origin. However, this theory is not yet entirely abandoned.

As to the ant-hill theory, there are at present in the Arkansas valley large numbers of ant-hills from three to four feet in diameter, and often as much as fifteen inches high. These are found on the very soil where the mounds occur. But if the ancestors or forerunners of the living ants were the builders of the mounds, they must have existed in

larger numbers and worked more industriously, for the present ant-hills are diminutive as compared with the mounds.

For some time the writer has entertained a theory very similar to that mentioned by Professor Branner. As above stated, these mounds are always on clay soil. In the Paleozoic region of Arkansas, they are on residual clay soils only a few feet deep, and of shale origin. As stated, the drainage where they occur is usually poor. These facts point to the action of ground-water within the clays or shales as being in some way responsible for the mounds. The action is thought to be one of the segregation of mineral matter, or as Professor Branner puts it, 'concretionary action on a large scale.' After the segregation, the volume may be further increased by hydration, oxidation and other chemical changes.

This idea was first suggested by a section of one of these mounds in the Arkansas valley that was brought to view by a small stream having cut its way through it and into the shale below, as shown in the figure. The uneroded portion of the mound was typical of



Section of a natural mound cut through by a stream.

the hundreds in the vicinity, and the general conformity of the surface to the arch of the shale would lead one to believe that the mound was due to the lifting of the shales beneath. While the writer has seen many sections through these mounds, this is the only one that discloses the shales, so that its value lies only in its suggestiveness.

In the Paleozoic region of Arkansas these mounds occur on at least three different beds of shale, two of which belong to the Lower Carboniferous, and the remaining one or more to the Coal Measures. These are all carbonaceous, clay shales. If their cause should prove to be a chemical one, induced by the action of ground-water, the question will present itself as to why they do not have a wide geographic distribution as well as a geologic one. The explanation would probably be found in the climatic conditions where the mounds occur. But this is scarcely worth speculating on till the origin of the mounds is determined.

A. H. Purdue.

The University of Arkansas,
Fayetteville, Ark.,
April 10, 1905.

The Basalt Mounds of the Columbia Lava.

The recent discussion of various types of mounds of uncertain origin leads me to call attention to a form common in eastern Washington, which seems thus far to have escaped printed notice. Very conspicuous examples are found in the vicinities of Spangle and Medical Lake. Similar ones occur near Winona in the old bed of the Palouse River. Less striking examples are generally found along the crests of all the canyons hewn out by streams in the basalt, especially on the north walls. The general proportion of these mounds is about that of an upturned saucer, but occasionally more convex. The most conspicuous are about four feet high, about twice the height of the more usual ones. In diameter they vary from ten to twenty feet, or rarely more. The first generalization that forces itself upon one is that these mounds occur only where there has at one time been flowing water. They are conspicuous enough even at the top of Snake River canyon, though the river now flows on a bed two thousand feet below. Where these mounds occur along the crests of canyons there is usually but a single series of them. Where, on the other hand, they occupy the old beds of broad shallow streams, as at Medical Lake and near Spangle, there may be acres of them, rather evenly scattered, and often quite close together.

The soil of these mounds shows no appreciable difference from the surrounding soil of basaltic origin, and except in the rare cases where water stands about their bases, they do not support a vegetation more or less luxuriant than that of the surrounding soil. There is nothing, in short, in the structure of the ordinary mounds to give a clue to their origin.

A splendid series of these mounds along the lower Palouse River in the vicinity of Winona would seem, however, to point clearly to their mode of origin. No feature of the Columbia Basalt is more conspicuous than the isolated castle-like towers and crags that persist wherever there has been surface erosion. On the walls of canyons these are especially striking. One scarcely needs more than ocular evidence to know that these persisting crags have remained because formed of harder material. Actual experience in blasting ditches through the top of such a persisting crag demonstrated it to be many times harder than ordinary basalt, and of a somewhat different structure.

In the old bed of the river near Winona the series of mounds shows every gradation from rock caps to mounds of basalt boulders; and from these to ordinary basaltic soil. The conclusion seems unavoidable, therefore, that these mounds are the result of decaying basalt caps, from about which flowing water had previously worn the softer surrounding rock.

The cause of these harder basalt centers may be analogous to that of nodules. Be that as it may, they seem to be quite evenly distributed through the rock, as evidenced not only by their fairly regular occurrence on canyon walls, but especially by the distribution of the mounds in old shallow stream beds.

It was mentioned above that along canyons the mounds were discernible mainly on the north walls. This is due to the prevailing winds of the region being southwesterly, a fact that has led to the deposition of a considerable layer of fine soil on the south walls, and, therefore, the mounds are buried. The occurrence of the mounds only on the crests is doubtless owing to the much greater effect of erosion on the slopes.

C. V. PIPER.

DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C.

SPECIAL ARTICLES.

LEVELING WITHOUT BASELEVELING.

SINCE the widespread adoption of Powell's views regarding baseleveling, whereby the earlier views regarding marine planation have been so generally displaced, truncated uplands—that is, uplands whose deformed structure is truncated by their surface—have come to be very generally interpreted as uplifted and more or less dissected peneplains. Doubt has been thrown, properly enough, on this interpretation in cases where the dissection of a supposed upland has progressed so far as to transform it into a series of discontinuous and uneven hills; but the interpretation has usually and deservedly had full acceptance in those cases where the dissection of the upland was but little advanced and where the inter-valley upland areas still preserved nearly plain surfaces, whose previous continuity across the valleys could not be reasonably questioned. It is evident, however, that the correctness of this interpretation depends on the impossibility of the production of similarly truncated uplands independent of normal baselevel; and those physiographers who have inferred crustal elevation on the evidence of truncated uplands have doubtless been convinced that this impossibility was demonstrated. True, it has long been understood that the processes of erosion and deposition in desert interior basins might result in leveling above baselevel, the waste from the highlands going to fill up the original depressions; but it does not appear that this process has been regarded as possibly accounting, after a change to a humid or normal climate and without any uplift, for the occurrence of truncated uplands in non-desert regions.

A recent article by Dr. Siegfried Passarge, of Steglitz, Germany, opens new possibilities in this direction. After extended observation on the desert plains of southern Africa, fully described in his book, 'Die Kalahari' (Berlin, 1904), Passarge concludes that these plains are the result of leveling without baseleveling, through the combined action of wind and water erosion; and that such plains, nearly everywhere showing a rock surface independent of structure and interrupted only here and there by residual hills or mountains—which he calls by Bornhardt's term 'Inselberge'—may be produced over large areas at any altitude above baselevel. His article, Rumpfflächen und Inselberg (*Zeitschr. deut. geol. Gesellsch.*, LVI., 1904, Protokol., 193–209), in which this

conclusion is announced, is well worthy of attention from American physiographers.

The principle of leveling without baseleveling, or Passarge's law, as it may be called, in contrast to Powell's law of leveling by baseleveling, suggests that the scheme of the normal cycle of erosion, so generally applicable in regions of ordinary or normal climate, should be systematically modified in such ways as will adapt it to the conditions of an abnormally dry or arid climate. This modification I have lately attempted in an article that will soon be published in the *Journal of Geology;* it is here presented in outline.

An extensive region of any structure uplifted in an arid zone to any altitude and with any form will, in the youthful stage of its cycle of erosion, be characterized by as many independent and incomplete centripetal drainage systems as there are depressed areas or basins within its limits: independent systems, because in an arid climate the basins can not be filled with overflowing lakes; incomplete systems, because many of the intermittent centripetal streams will wither away on the slopes and fail to join forces in trunk streams on the basin floors. The early stage of a normal cycle, where all basins are filled to overflowing and where all streams are continued until they unite in trunk rivers which reach the sea, is characterized by a rapid increase of relief, due to the incision of valleys. The early stage of the arid cycle is, on the other hand, characterized by a decrease of relief, due to the aggradation of the basins with the waste washed down from the enclosing highlands. As youth advances towards maturity, the initially independent basins will become more and more completely confluent, either by headward erosion on the slopes of the lower basins, or by the overflow of waste across depressions in the borders of the higher basins; thus from original independence will be developed a maturely integrated and interdependent system of drainage slopes, although trunk rivers will still be wanting. Maturity may be said to be fully established when large areas are thus brought into systematic correlation. At this stage, there may still be some unreduced uplands, but there will also be increasing piedmont areas of degraded, rock-floored plains, inclined gently towards the greatly enlarged central aggraded basin floor; and the composite plain thus produced will have no definite relation to normal baselevel. In so far as the erosion of arid regions has previously been discussed, it would appear that this stage, here called maturity, has been regarded as the old age of a desert, and that it has been taken to mark the end of the changes to which an interior basin is subject, unless it is attacked by the headward extension of exterior streams and thus dissected and reduced to normal baselevel; but as Passarge clearly shows, the old age is yet to come, and with a systematic sequence and grouping of features essentially unlike those just described. The action of the wind is yet to be considered.

In the earlier stages of the cycle, while the slopes are still varied and strong, transportation and trituration by the wind is probably of small value in proportion to that of the occasional streams and floods. But as the barren surface becomes more and more even, the relative importance of wind action increases; for unlike running water, the wind does not depend on local slopes for its activity; it is about equally strong everywhere on a surface of moderate relief, and has no subdivision into subordinate parts that correspond to small headwater streams, whose slopes must be steeper than that of their trunk river. The wind may sweep sand along a level floor, or even up a moderate slope; and whirlwinds may raise dust high into the air, and there give it to the upper currents; both of these processes may carry desert waste outside of the desert region under consideration, and thus the mean level of the desert may be very slowly reduced. The surface may, indeed, in this way eventually be worn below sealevel, as several writers have suggested; but the form that the surface will exhibit during its slow reduction has not, to my knowledge, been especially considered until in the recent statement of this aspect of the question by Passarge.

It might at first sight appear that when the winds gain the upper hand in the processes of transportation, they would tend to excavate extensive basins wherever the weathering of

the rocks resulted in the production of fine dusty waste; and that, inasmuch as the winds know no baselevel, there would be no definitely assignable limit to the unevenness of the surface thus produced. This might be true in absolutely rainless regions; but such regions are not known. The most desert regions of the world have occasional rainfall, and are from time to time visited by showers heavy enough to cause floods; and the intermittent action of such floods will put an effectual stop to the development of deep basins by wind action. As soon as the winds succeed in sweeping out a shallow depression, that part of the integrated drainage slopes which leads toward the depression will, when rain falls and floods are formed, provide a supply of waste with which the depression will be aggraded. Further deepening of the depression below its surroundings is thus effectually hindered. The wind may then begin the excavation of another depression elsewhere, only again to be defeated by the local inwash of a waste cover. Not an uneven surface of many hills and hollows, but a remarkably even plain must result from the long continuance of these antagonistic processes.

During the development of such a plain, a series of systematically irregular changes will run their course. As the exportation of desert waste by the winds continues, the area of the central aggraded basin floor must diminish, while that of the surrounding degraded rock plains must increase. At the same time, the integrated drainage system of maturity will be more and more completely disintegrated and replaced by many local and variable systems of extremely indefinite separation. Eventually all the central accumulation of waste will have been exported by the winds; the rock-floored plain will have been worn down lower than the bottom of the deepest initial depression, so that it will then extend throughout the region, except for residual mountains of rocks most resistant to dry weathering. Thin veneers of gravelly waste will remain, swept hither and yon by the intermittent fluctuating disintegrated drainage; shallow 'saltpans' may occur from place to place and from time to time; but large areas of rock plains carrying only scattered stony waste, will abound; this is the condition of true old age in such a region. Once attained, it persists, slowly worn lower and lower, possibly sinking below sealevel, until disturbed by crustal movements or climatic change. It is old rock-floored desert plains of this character and apparently of this origin that Passarge describes as occupying thousands of square miles in South Africa.

Two interesting consequences of this scheme should be pointed out.

Every truncated upland that has been described as an uplifted and more or less dissected peneplain should now be reexamined with the object of learning whether it may not have originated as a desert plain at its present altitude above sealevel, and afterwards suffered dissection as a result of climatic change. True, we are to-day more accustomed to movements of the earth crust, in the way of elevations and depressions, than to climatic changes, in the way of transforming arid regions to humid regions and *vice versa;* but perhaps this habit of thought is only a fashion of our time. A century ago, movements of the earth's crust indicated by the discovery of marine fossils on the higher peaks of the Alps were regarded with astonishment, not to say incredulity. A century hence, variations of climate may be accepted as freely as changes of level are now. The way towards such an opinion is opened by the discovery of glacial periods in various geological ages, and it is not hindered so much as it was once by supposed evidence of the correspondence of earlier climatic zones with those of to-day. We should, therefore, open our minds widely to the possibility of explaining truncated uplands as ancient desert plains not changed in elevation, but only in climate; and this possibility should not be set aside because it seems improbable, but only because it may be shown on good and sufficient grounds to be inappropriate to the case under consideration. It may be added that, as far as I have undertaken a revision of the origin of truncated uplands, as is suggested above, nearly all the familiar cases seem to possess characteristics that accord with their origin as uplifted peneplains and not as desert plains; and that there

is therefore less ground for change of generally accepted opinions than the suggestion of the need of revision might for the moment indicate.

The second consideration concerns the processes of combined induction and deduction by which the complete or logical method of scientific investigation is constituted. In view of the possible change of interpretation now open for truncated uplands according to Passarge's law, it might be said by one who prefers to work on more purely inductive lines: "Behold, here is another case in which deduction has led the investigator astray! He thought that he could deduce the sole conditions under which truncated uplands could be formed, and that these conditions necessitated uplift after degradation; now he finds a new series of conditions under which such uplands may be formed and all his previous conclusions are uncertain. Let us, therefore, beware of deductive or imaginative methods, and hold fast to the safer methods of observation and induction." In reply to such a warning, one might say—besides pointing out that all problems which deal with unseen processes necessarily involve deduction and that the deductive side of the work should be conscious and systematic—that the fault in the method by which truncated uplands have heretofore been discussed lies not in the too free use of deductive methods, but in their too limited use. The mistake lies in our not having years ago set forth, by purely deductive methods, just such an analysis of the geographical cycle in an arid climate as has now been provoked by the discovery of rock-floored desert plains. Such an analysis does not involve any new or difficult problems; it might have been successfully attempted long ago; the difficulty that stood in the way lay not in the problem itself, but rather in the habit among physical geographers of trusting too largely to observational methods and of neglecting the aid that deductive methods furnish. The lesson of the problem is, therefore, that deduction should be pushed forward more energetically and systematically than ever; always checking its results as far as possible by confronting them with the appropriate facts of observation, but never halting in the reasonable extension of deductive conclusions because the corresponding facts of observation have not been detected; never lessening the activity with which exploration and observation are pursued, but always using the spur of deduction along the paths suggested by 'multiple working hypotheses.' The problem of the erosion of mountain valleys of Alpine glaciers teaches the same lesson: if physiographers had, thirty years ago, been well practised in deductive methods, they might have easily extended Playfair's law regarding the accordant junction of branch and trunk streams from the case of stream surfaces to the contrasted case of stream beds, and from the case of water streams to the analogous case of ice streams; thus they might have predicted that, if Alpine glaciers were effective eroding agents, glaciated mountain valleys ought to show discordant or hanging side valleys; and in going to the mountains they would have found the prediction correct, and the basis of the prediction—that glaciers are effective eroding agents—would have thus been verified. So with the geographical cycle in an arid climate: there is nothing difficult in the series of deductions that lead to the expectation of rock-floored desert plains, independent of baselevel, as the product of arid erosion; the only obstacle to the development of these deductions has been the habit of not making them. This is a habit that should be broken.

W. M. Davis.

NOMENCLATORIAL TYPE SPECIMENS OF PLANT SPECIES.

The recent 'Code of Botanical Nomenclature' now usually known as the Philadelphia Code, states as the fourth fundamental principle, 'The application of a name is determined by reference to its nomenclatorial type.' This means that a specific (or subspecific) name stands or falls according to the disposition of the type specimen. It is not proposed here to discuss the advantages or disadvantages of this method of determining the application of names, although to the writer this method seems much more likely to secure 'stability, uniformity and convenience in the

designation of plants,' than the method of applying the name according to tradition, authority or consensus of opinion. Instead of this, then, it is proposed to discuss briefly the practical difficulties which may arise in this method of types, and how these difficulties may be overcome.

The code mentioned above states in regard to the application of names (Canon 14) the following: 'The nomenclatorial type of a species or subspecies is the specimen to which the describer originally applied the name in publication.'

Where an author in connection with an original description has indicated a definite specimen, there is usually no difficulty in determining the type. When an author indicates only the number or other data occurring on the label in numbered sets prepared for distribution, but does not specify a particular specimen, the type would be the one from which the author drew up the description and would presumably be in his herbarium. The other specimens would then be designated as duplicate types. Not infrequently the author draws the description from all the specimens of a given number in a set, in which case the specimen in the herbarium of the author, or of the institution at which he is located, must be arbitrarily chosen as the type.

Many difficulties arise in determining the types of the older authors, as the practise of designating specimens as such is quite recent. When a name is based upon a single specimen this becomes the type though not actually designated as such. If more than one specimen is cited, but none designated as the type it becomes necessary to select one of these.

The above mentioned code provides that 'When more than one specimen was originally cited, the type or group of specimens in which the type is included may be indicated by the derivation of the name from that of the collector, locality or host.' (Canon 14, a.) Further, if no type can be selected on this basis, 'Among specimens equally eligible, the type is that first figured with the original description, or in default of a figure, the first mentioned.' (Canon 14, b.)

There are many original descriptions, however, in which no specimens are cited, but instead the locality or range may be given. It then becomes necessary to consult the author's herbarium or the herbarium in which his plants are deposited. Specimens which bear the name in his handwriting should be given preference in the selection, and of these the type is the one from the locality first mentioned, or the one collected by the person for whom the species is named. Even with these aids in selection it may be necessary to arbitrarily select a certain specimen from among those equally eligible. This should be done by a monographer and only after a careful examination of the available data. Where possible the most perfect specimen should be selected or the one most nearly corresponding to the original description. For example, if the species is known to produce rhizomes and only one of the otherwise available specimens showed these organs, this specimen might be selected. Occasionally the original description includes more than one form and the specimens are correspondingly diverse. It is then very necessary to use particular care in the selection of the type. Muhlenberg described *Panicum depauperatum* without indicating a type. In his herbarium deposited in the Philadelphia Academy of Natural Sciences is the sheet of specimens upon which the name is founded. In this sheet are plants of *P. linearifolium* Scribn. and two forms of what is now considered to be *P. depauperatum* Muhl., one with glabrous sheaths and one with pilose sheaths. From the description one can not determine which one of these forms was intended. Probably all were included as one species. Since the form with smaller spikelets has been distinguished by Professor Scribner as *P. linearifolium* the type of *P. depauperatum* should be selected from the specimens with large spikelets. When the two or more species confused by one author are distinguished by a later author, this author should determine the type. The old specific name should remain with the type and the new name be based upon a different type. Much confusion has arisen because of failure to follow this rule. If the original specimens are made up of both species, the author of the

later name, the so-called segregator, should indicate which specimen is the type of each species. Professor Scribner might with equal propriety have given the new name, in the case above mentioned, to the form with large spikelets, except for the fact that tradition, and the recorded history of the plant had attached the name *P. depauperatum* to this form. But, as stated, the original specimens are in part with glabrous sheaths and in part with pilose sheaths. The original description states that the sheaths are pilose. In a recent study of this collection in preparation of a monograph of the *Panicums* I took the liberty of selecting a specimen from the cover that had pilose sheaths, and attaching a ticket with such indication.

Let us consider another case and suppose that a reference to Muhlenberg's herbarium had shown only a specimen of *P. linearifolium* Scribn. In this case this specimen would become the type of the species *P. depauperatum* Muhl., since it agrees with Muhlenberg's description, and the species which had been called *P. depauperatum* would receive a new name.

While it is true that the name of a species rests upon its type specimen, yet the specimen can not take precedence over the description. If it is clear that a supposed type specimen disagrees with the description to such an extent that it can not be the plant which the author describes, then the plant must be disregarded in determining the type. In a previous paper I mentioned that the specimen in the Linnean Herbarium labeled in Linnæus's handwriting *Agrostis rubra* is a panicle of a *Sporobolus*, apparently *Sporobolus juncea* of our southern states. There is clearly an error here as the plant does not agree with the description. On the other hand, there are many cases in which the type specimen does not agree in all respects with the description. The sheaths may be described as glabrous when a few of the lower may be pubescent. If there is no reasonable doubt that the specimen was examined by the author and is the specimen or at least one of the specimens upon which the description was based, such specimen should be accepted as the type.

In cases where the first cited specimen is chosen as the type according to rule, it not infrequently happens that this is a form which does not represent faithfully the author's idea of the species. The specimens may have been arranged geographically and the first locality may be represented by a specimen of an aberrant or uncertain form. But the rule is explicit on this point and is certainly easy to interpret and follow.

Torrey and Gray publish many of Nuttall's manuscript names, but in listing specimens those collected by Nuttall may not be mentioned first; nevertheless, his specimens should be taken as the type by a broad interpretation of Canon 14, a. *Cardamine hirsuta* L. *β acuminata* Nutt. mss. in Torr. and Gray Fl. 1: 85. The specimens cited are: British America, Richardson; Oregon, Nuttall. The latter specimen should be taken as the type.

When there is no original specimen we must make use of Canon 14, c, in determining what shall serve as the type: 'In default of an original specimen, that represented by the identifiable figure or (in default of a figure) description first cited or subsequently published, shall serve as the type.' It sometimes happens that the citations will lead to a specimen, which then should be taken as the type. *Poa flava* L. is based upon a citation from Gronovius Flora Virginica, that is, Linnæus gives a specific name to a plant described by Gronovius. A reference to Gronovius shows that he mentions a particular specimen, Clayton No. 273, which plant is deposited in the herbarium of the British Museum and is the type of *Poa flava* L.

I will now refer briefly to a second series of cases, those where there has been only a change of name. If a species has been transferred from one genus to another the type specimen is determined according to the rules mentioned above, by a reference to the original description. If a new name is given to a species because the old one is untenable, the type of the old name becomes the type of the new. There are no new difficulties presented here, if there is no doubt that there has been only a change of name. However, one finds many cases where an author has

changed a name and at the same time has given a description of the species as he understands it. The description may not agree with the historic type. If the author states the synonymy in such a manner that there is no doubt that he meant to change the name of a given species, the old type must be retained regardless of the description or the specimens cited at the time the change is made. This may sometimes become a question of judgment to decide whether there is primarily a change of name or a description of a species with a doubtful reference to a previously published species. For example:

(*a*) *Panicum barbipulvinatum* Nash. Mem. N. Y. Bot. Gard. 1: 21. 1900.

Panicum capillare brevifolium Vasey; Scribner, Bull. U. S. Dept. Agric. Div. Agrost. 5: 21; not *Panicum brevifolium* L.

Then follows an extended description and finally a specimen is cited as the type (Rydberg and Bessey 3544). This is evidently a change of name and the type should remain the same and be determined by a reference to the original publication of *P. capillare brevifolium* Vasey, where a certain specimen from Montana is mentioned, Rydberg & Shear 436. Even though it may have been that the plant described by Mr. Nash was a different species, still the name *P. barbipulvinatum* Nash is a typonym of *P. capillare brevifolium* Vasey and a new type can not be assigned.

(*b*) *Panicum scribnerianum* Nash. nom. n. Bul. Torr. Bot. Club. 22: 421. 1895.

Panicum scoparium S. Wats. in A. Gray, Man. Ed. 6, 632. 1890. Not Lam.

P. scoparium minor Scribn. Bul. Univ. Tenn. 7: 48. 1894. Not *P. capillare minor* Muhl. 1817.

The synonymy is arranged chronologically and both names are untenable. I believe that the fact that Mr. Nash chose *scribnerianum* for the new name is sufficient evidence to show that he intended to change the name of *P. scoparium minor* Scribn., and hence the type of the former is also the type of the latter, namely, a specimen from middle Tennessee collected by Gattinger.

Others may hold that the new name must rest upon the type of the plant described by Watson, since this is the first synonym cited. A reference to Watson's description shows that *P. pauciflorum* is given as a synonym in the 6th edition of the 'Manual'; that the description is identical with that under *P. pauciflorum* Ell.? of previous editions back to the first; that in the first edition the range is given as N. Pennsylvania (Carey) and W. New York to Michigan. In this case Carey's specimen becomes the type of the species doubtfully referred to *P. pauciflorum* Ell. by Gray and also the type of *P. scribnerianum* Nash.

(*c*) *Panicum minus* (Muhl.) Nash. Bul. Torr. Bot. Club. 22: 421. 1895.

P. diffusum Pursh 1814. Not Swartz 1788.

P. capillare minus Muhl. 1817.

P. philadelphicum Bernh. 1829.

Mr. Nash then describes his plant briefly, but sufficiently to show that it is not Muhlenberg's plant, but *P. capillare minimum* Engelm. Nevertheless, the type of *P. minus* (Muhl.) Nash must be that of *P. capillare minus* Muhl. (which, by the way, was not thus published by Muhlenberg), as there is primarily a change of name. It might be argued that *P. diffusum* Pursh is also a typonym of *P. minus* Nash. If Mr. Nash had given an entirely new name to *P. diffusum* Pursh, then the new name would have been a typonym of *P. diffusum*, but he chose to take up another name founded upon a different type, in which case *P. minus* Nash and *P. diffusum* are synonyms or at least supposed to be, but they are not typonyms.

(*d*) *Dactylis cynosuroides* L. Spec. 71. 1753.

Linnæus gives first a description of his own apparently based upon the specimen in his herbarium, which is *Spartina polystachya* Willd.; second, a citation from Gronovius Flora Virginica, which is supported by a specimen of *Spartina polystachya* Willd. in his herbarium; thirdly, a variety β which is *Spartina glabra* Muhl. The localities given are Virginia, Canada, Lusitania. All the evidence here is in one direction, and the type specimen is the one in the Linnæan herbarium. Michaux next transfers this to his genus *Trachynotia* as *T. cynosuroides*. As he uses the specific name *cynosuroides*, and quotes as

synonym *Dactylis cynosuroides* L., we must consider this as primarily a change of name, although the plant he describes comes from Hudson Bay, and probably is *Spartina cynosuroides* as generally understood, that is, the plant from the interior, with few spikes.

Spartina cynosuroides Willd. Enum. 1: 80. 1809, must also be considered as a typonym of *Dactylis cynosuroides* L., since it is primarily a change of name. The description also applies. The two synonyms cited are *D. cynosuroides* Willd. Sp. 1: 40, which is based on Ait. Hort. Kew. 1: 103, which in its turn is based on *Dactylis cynosuroides* L. sp. 2d Ed. 104, and secondly upon *Trachynotia cynosuroides* Michx.

It is evident that Michaux took up Linnæus' name for the wrong plant, and his two species *T. cynosuroides* and *T. polystachya* must stand as synonyms. This leaves without a name the plant which Michaux describes under *T. cynosuroides*.

It is not best to be too arbitrary in deciding such cases and thus be led into an absurdity. This is particularly true for Linnæan species, as the conditions are unusual. Linnæus is introducing a new system and gives specific names to a large number of plants already well known. Judgment should be used so that a blind following of rules will not lead us into untenable positions. The American species are quite likely to be based upon type specimens which agree with his description. If there is no specimen in the Linnæan Herbarium the type should be traced, if possible, to a definite plate. If there are no plates and there is a conflict of cited descriptions, much care and study may be necessary in deciding upon what shall be a substitute for the type.

It is to be noted that there are many species of plants for which there are no nomenclatorial types. Only a few of Walter's grasses described in his 'Flora Caroliniana' are preserved in his herbarium now deposited in the British Museum. Names of species not represented in this collection are based upon descriptions and one can only say there is no type specimen. It may be that there is not in existence the type specimen of a species, according to the rules quoted, yet there may be other specimens which for practical purposes may take the place of the type. Many type specimens were lost at the time Professor Scribner's herbarium was destroyed by fire. Where there are duplicate types (specimens of a set or series bearing the same number or other data to show that they are a part of the same series) one of these may be chosen. It may be necessary to select a second or subsequently cited specimen to take the place of the type, when the latter is known to be lost. In all cases such a selection should be done by a monographer who has had opportunity to give the matter careful study.

A type specimen may consist of more than one individual plant. Consequently portions of the type specimen may be deposited in different places. In the National Herbarium are portions of the types of many species of grasses, such as those of Trinius, Muhlenberg and Elliott, sometimes consisting of an individual, more often of spikelets. These cases should not be confused with those mentioned above, where a description may have been drawn from all the specimens of a given number, one of which was retained in the author's herbarium and the remainder distributed. It would seem better, here, to distinguish the specimen or sheet of specimens in the author's herbarium as the type.

Finally, the following suggestions as to nomenclature are submitted:

Duplicate type: Specimens of the same series or set as the type as indicated by the number or other data.

Co-type: A specimen cited with the original description in addition to the type specimen.

A. S. Hitchcock.

U. S. Department of Agriculture.

CURRENT NOTES ON METEOROLOGY.

Mountain Sickness in the Sikhim Himalaya.

Although much has been written about the physiological effects of high altitudes, every new contribution to the subject is of interest. In a recent account of 'The Sikhim Himalaya' (*Scot. Geogr. Mag.*, April, 1905), Mr. Douglas W. Freshfield gives the following summary of his party's experiences: Mountain

sickness was felt more at about 15,000 to 16,000 feet than at 5,000 feet higher, and it was felt in very different degrees by different individuals. Most of the party suffered from lassitude and fatigue after making slight exertion; some were wholly prostrated for a time, and one coolie died. Other persons were entirely free from any perceptible inconvenience. Among the latter was a Goorkha, who *ran* back over a 20,000-foot pass to hurry up the loiterers. Another member of the party, an Englishman, experienced an increased appetite and gained in weight during the journey. Mr. Freshfield believes that the intense glare and heat on the snow had much to do with the sickness of some of the party at 15,000 feet.

THE KALAHARI DESERT.

A RECENT book on the Kalahari Desert ('Die Kalahari,' by Dr. Siegfried Passarge, Berlin, Reimer, 1904) contains a discussion of many interesting matters of a meteorological and climatological nature. Among these topics the following call for special mention: the climate of South Africa and of the Kalahari, with notes on the progressive desiccation of the country, based on comparisons of the observations of earlier and later explorers (Chap. V.); the orographic and hydrographic conditions of the Kalahari, with the evidence for the desiccation (Chap. XXXI.); the effects of rock-weathering under different climates, especially with reference to deserts (Chap. XXXV.), and the geological effects of wind action. Dr. Passarge's book, based on his own study of the Kalahari region during the years 1896–98, will be found to contain much of interest, especially to geologists, zoologists, botanists and meteorologists.

METEOROLOGICAL OBSERVATORY, NEW YEAR ISLAND.

IN the March number of the *Geographical Journal* Captain H. L. Crosthwait describes a recent journey in Patagonia, and also calls attention to the Argentine meteorological observatory, established in 1902, on New Year Island, in lat. 54°59′ S., about five miles off the north coast of Staten Island. Four Argentine naval officers man the station. Since the observations were begun the maximum temperature recorded is 55.4° F.; the minimum, 16.4°; the annual mean, 41°.

NOTES.

THE International Bureau of the South American Republics has recently issued a report upon 'Bolivia,' in which the climate of that country is discussed in a general way.

A HIGHLY mathematical discussion, by Max Margules, entitled 'Ueber die Energie der Stürme,' appears in the *Jahrbuch* of the Austrian Central Meteorological Institute, volume for 1903 (1905). R. DEC. WARD.

NOTES ON ENTOMOLOGY.

THE varying positions in which insects rest have been but little investigated by entomologists. It is now known that in many groups the position of repose is constant, and of importance to the insect. In the Lepidoptera it often has a direct bearing on the color pattern, and on the question of protective resemblance. Dr. J. T. Oudemans has recently studied the subject and furnishes* many interesting observations on positions adopted, the arrangement of colors, the parts of the color-pattern exposed or hidden, and the cryptic value of the position and color. The photographs furnish many striking examples of protective resemblance, most of which are familiar to the American collector.

MR. PERGANDE'S revision of our phylloxeras, after much delay, has at last been issued.† The species affecting the hickory (being most numerous) are classed by themselves, and arranged in four groups according to the nature and position of the gall. Thirty species and several varieties are recorded from this genus of trees. Descriptions of the gall, stem-mother and larva are given for all species,

* 'Étude sur la position de repos chez des Lepidoptères,' *Verhdl. Konink. Akad. Wetensch. Amsterdam*, X., no. 1, pp. 90, 11 pls., 1903 (1904).

† 'North American Phylloxerinæ affecting *Hicoria* (*Carya*) and other trees,' *Proc. Davenport Acad. Sci.*, Vol. IX., pp. 185–273, 22 pls., 1904.

and various other stages in many of the forms. The complete life history is presented of one species—*P. perniciosa.* Seven other species are treated, on the willow, sour gum, poplar, oak and chestnut. *P. vastatrix,* the phylloxera of the vine, is purposely omitted. The excellent figures show the galls, as well as their inhabitants, but it is very much to be regretted that the colored figures of the galls prepared by the author could not have been published instead of the photographs.

The second entomological publication of the Carnegie Institution is equally as interesting as the first. It treats of the colors of a genus of common wasps—*Polistes.** There are chapters on the origin, development and variation in the color pattern in these wasps; the geographical distribution of certain types of coloration in the United States, and a comparison with the distribution of these wasps in the world; on the chemical nature of the pigments; on variation in specimens from the same nest, and the degree of variability in males and females; and on the correlation in markings between different parts of the insect. These are followed by technical descriptions of the known species, and a bibliography of the subject.

For several years the Entomological Institute at Gifu, Japan, conducted by Mr. Nawa, has published a semipopular entomological paper. It now commences a series of more pretentious publications, the first number of which treats of the Sphingidæ of Japan, by K. Nagano.† It is in folio size and consists of 48 pages in Japanese and five colored plates, with an English translation of 15 pages in the back. Thirty-four species, with their larvæ, are figured on the plates. These are rather too highly colored.

A new entomological journal is *Časopis,* or *Acta Societatis Entomologicæ Bohemiæ.* It is published in Bohemian at Prague; four numbers are issued each year. It is edited by a committee of five Bohemian entomologists, headed by the eminent neuropterist, Professor Franz Klapálek. It treats mostly of local insects.

The entomological literature of New Zealand has been enriched by two valuable books. One of them is a catalogue of all New Zealand animals.* The insects occupy a large part of the work. In the introduction there is a list of the various expeditions that have collected material on New Zealand; and an account of the different elements of the New Zealand fauna, and notes on the geological history of the island. The other book is a systematic account of the Neuroptera.† The neuropteroid fauna of New Zealand is characterized by many peculiar genera of caddice flies; and the author, in an appendix, shows that their larvæ are the principal food of trout.

M. Ch. Kerremans has begun a monographic account of the family Buprestidæ,‡ a group which he has studied for many years. Five parts have been issued, with 160 pages. The introduction contains much ethological matter on geographic distribution, variation, sexual dimorphism, mimicry and protective resemblance, etc.

Dr. Sjöstedt, who a few years ago published a considerable work on the termites of Africa, has now issued an appendix to that work.§ He here gives synoptic tables to all the species, new localities for many old species and descriptions of a considerable number of new forms. He wisely uses the genus *Termes* in the broad sense, ignoring the many new genera which have recently been created from it. There are many notes on the nests and habits of the species.

That the famous *Vedalia cardinalis* is not the only useful species of its genus is evi-

* W. M. Enteman, 'Coloration in Polistes,' Carnegie Institution, Washington, Publ. no. 19, 1904, pp. 88, 4 col. plates, 2 maps.

'Icones Japonicum Insectorum,' Vol. I., Lepidoptera Sphingidæ. Gifu, Japan, 1904.

* 'Index Faunæ Novæ Zealandiæ,' by F. W. Hutton; London, Dulau and Co., 1904, 370 pp.

† 'New Zealand Neuroptera,' by G. V. Hudson; London, West, Newman and Co., 1904, 102 pp., 11 colored plates.

‡ 'Monographie des Buprestides,' Bruxelles, 8vo, 1904–1905.

§ 'Monographie der Termiten Afrikas, Nachtrag,' *Kgl. Svenska Vetensk.-Akad. Handl.,* Bd. 38, 1904, pp. 120, 4 pls.

denced by a paper on an injurious Indian scale-insect by Mr. Stebbing.* The scale-insect is a very large one (10–18 mm. long) that occurs in great numbers on sâl-trees in India. The *Vedalia, V. guerini,* is very voracious and feeds, both as larva and adult, on the scale. The latter, however, is so large that a beetle may suck its fill without killing the scale, which may feed or walk about while the *Vedalia* is sucking out its juices.

A MOST welcome addition to the small amount of good literature on the early stages of our beetles is the recent article by Messrs. G. Dimmock and F. Knab.† It contains a summary of the present knowledge of the larval structure in this family; directions for the rearing of the larvæ, notes on the habits of many species, detailed accounts of the early instars of four species, and a bibliography at the end. The four plates illustrate the larvæ and details of external anatomy.

DR. K. W. VERHOEFF has issued another one of his studies on insect morphology.‡ It is on the Embidæ, and deals especially with the structure of the thorax in this family. He finds further evidence in favor of the compound nature of the segments, and gives a table of the number of segments (33) which he traces in primitive insects. Systematically he would place the Embiidæ in the order Isoptera, dividing that order into two suborders, the Termitina and the Adenopoda, a new suborder for the Embidæ.

IN volume 12, no. 1, of the *Novitates Zoologicæ* Hon. N. C. Rothschild has given descriptions of sixteen new fleas of the genus *Ceratophyllus* from North America, mostly from western Canada. With them are four plates illustrative of the sexual characters of the species.

MR. W. F. KIRBY, of the British Museum, has added another volume to his series of world-catalogues of insects. This time it is the Orthoptera.* This volume treats of the Forficulidæ, Hemimeridæ, Blattidæ, Mantidæ and Phasmidæ. Each species is numbered, and the distribution is given on the margin of the page. Although the specialist will undoubtedly find errors and omissions, such catalogues are the most valuable additions that can be made to entomological literature.

NATHAN BANKS.

† 'On the Life History of a new Monophlebus from India, with a Note on that of a Vedalia Predaceous upon it,' *Journ. Linn. Soc. London, Zool.*, XXIX., pp. 142–161, 3 pls.

‡ 'Early Stages of Carabidæ,' Bull. no. 1, Springfield [Mass.] Museum of Natural History, Dec., 1904, pp. 55, 4 pls.

‡ 'Zur vergleichenden Morphologie und Systematik der Embiiden,' *K. Leop.-Carol. Deutschen Akad. Naturf.; Nova Acta,* LXXXII., pp. 145–205, 4 pls.

* 'A Synonymic Catalogue of Orthoptera,' Vol. I., Brit. Mus., London, 1904, pp. 501.

MEN OF AFFAIRS IN EDUCATION.

MR. FRANK A. VANDERLIP, ex-assistant secretary of the Treasury, and now vice-president of the National City Bank, addressed the students of Girard College on May 20, on the general subject of educational benefactions. He is reported to have said:

> The professional educator is quite as likely to become narrow and provincial as is any other specialist. The president of one of our great eastern universities told me a few days ago that he had been making an exhaustive examination of the history of his institution, and he had discovered that the great progressive steps which the university had taken in 150 years had been against the protest and the opposition of the faculty. The trustees from time to time brought forward new plans of organization, and broader ideas regarding the curriculum. The faculty had in every case voted adversely, and when the changes were made, they were made only by the trustees taking the responsibility upon themselves. Alexander Hamilton, with his consummate wisdom, once worked out a plan of reorganization for the university, only to have it meet with the usual vote of emphatic protest from the faculty, but final adoption by the trustees. Now, in the light of years of experience, these changes have been seen to be wise in the main. The unavailing protests of the learned men who made up the institution's faculty are discovered sometimes to have been based on narrow grounds lacking the impersonal view and judgment that should have been brought to bear upon the questions.

We should like to ask Mr. Vanderlip whether bank presidents and vice-presidents are not also likely to become 'narrow and provincial' and to lack 'impersonal view and judgment.' It appears that in accordance with Mr. Vanderlip's views university professors should administer the affairs of the National City Bank.

THE CARNEGIE FOUNDATION.

The foundation endowed by Mr. Andrew Carnegie with bonds of the market value $11,500,000, to establish a retiring pension fund for college professors, was incorporated at Albany, on May 10, with its principal office in New York City. The papers are signed by Nicholas Murray Butler, Alexander C. Humphreys, Henry S. Pritchett, Robert A. Franks and Frank A. Vanderlip for the board of directors.

The objects of the foundation are thus described:

The particular objects for which said corporation is formed shall be:

(*a*) To receive and maintain a fund and apply the income thereof as follows:

To provide retiring pensions, without respect to race, sex, creed, or color, for the teachers of universities, colleges and technical schools in the United States, the Dominion of Canada and Newfoundland, who, by reason of long and meritorious service in these institutions shall be deemed by the board of directors to be entitled to the assistance and aid of this corporation or who by reason of old age or disability may be prevented from continuing in the active work of their profession;

To provide for the care and maintenance of the widows and families of the said teachers;

To make benefactions to charitable and educational institutions, and generally to promote the cause of science and education; provided, however, that the said benefactions shall be made to, and the said retiring pensions shall be paid to the teachers, their widows or families, of only such institutions as are not under control of a sect, do not require a majority of their trustees governing bodies, officers, faculties or students to belong to any specified sect, and do not impose any theological test.

THE INCREASED ENDOWMENT OF HARVARD COLLEGE.

It is announced that $1,800,000 has been contributed toward the endowment of $2,500,000 which is being collected 'to increase the present totally inadequate amount available for the salaries of the teaching staff of the college,' of Harvard University. The circular which contains this information and appeals for additional subscriptions is signed by Bishop William Lawrence, Francis L. Higginson, Charles S. Fairchild, Henry S. Howe, Francis R. Appleton, Augustus Hemenway, Robert Bacon, Theodore Roosevelt, James J. Storrow and Benjamin Carpenter.

The circular says: "The position of Harvard to-day among American universities is due not so much to its age, traditions, or able administration as to its noble line of teachers. That the teachers in the college should be the best in the land; that the older professors should be free from the cares of a straitened income; that the younger teachers should be able to give themselves without distraction to their work, and that the best men should not be drawn away to other colleges, but should see before them reasonable promotion in work and salary, is essential to the leadership of Harvard and the culture of her sons." It is pointed out that the total of salaries in Harvard College is $437,821, and the average per capita allowance for the staff of 279 teachers is only $1,570. "In these days of increasing cost of living and of higher salaries in commercial and industrial pursuits," the circular adds, "the alumni and friends of Harvard will not allow the men who teach their boys and who fill the chairs of the great teachers of the past to receive these meagre wages."

THE INTERNATIONAL ANATOMICAL CONGRESS AT GENEVA.

The first International Congress of Anatomists will be held at Geneva, Switzerland, on the 7th to 10th of August. The following national societies are to participate in this congress: The Anatomical Society of Great Britain, the Anatomische Gesellschaft, the Association des Anatomistes, the Association of American Anatomists and the Unione Zoologica Italiana. The organization of the congress has been entrusted to a committee representing these societies, and consisting of Professors Minot, Nicolas, Romiti, Syming-

ton and Waldeyer. The presidents thus far named are Professor Sabatier, of Montpellier; Professor Romiti, of Pisa, and Professor Minot, of Harvard. The vice-presidents are Professor Bugnion, of Lausanne; Professor Valenti, of Bologna, and Professor Carl Huber, of Ann Arbor.

A general circular is in preparation, which will shortly be distributed to all members of the various societies taking part in the congress, and to such other persons as may request to have it sent to them. The congress owes its successful initiation largely to the zealous devotion of Professor Nicolas, of the University of Nancy, and inquiries as to further details on the part of those interested may be addressed to him. We hope to publish later a more detailed notice of the final arrangements and program.

SCIENTIFIC NOTES AND NEWS.

THE faculty of Princeton University gave a dinner on the evening of May 17 in honor of Professor Charles A. Young, who becomes professor emeritus after a service of twenty-eight years as professor of astronomy. Among the speakers were President Woodrow Wilson, of Princeton; President Francis L. Patton, of Princeton Theological Seminary; Mr. M. Taylor Pyne, of New York; Professor Silas Brackett, Professor W. F. Magie and Dr. Henry Van Dyke, who read a poem. A loving cup was presented to Professor Young.

PROFESSOR J. J. THOMSON, F.R.S., of Cambridge University, has been elected professor of natural philosophy in the Royal Institution to succeed Lord Rayleigh, who becomes honorary professor.

PRESIDENT ROOSEVELT will receive the degree of LL.D. from Clark University on June 21, when he goes to attend the commencement exercises at the university.

THE pupils and friends of Professor Charles Eliot Norton have presented to Harvard University a fund of about $24,000, in his honor, to be used for the purchase of books for the library.

THE seventieth birthday of Professor Caesare Lombroso will be celebrated in connection with the sixth International Congress of Criminology, which meets at Turin next year.

DR. N. WILLE, professor of botany in Christiania, has been elected a foreign member of the Academy of Sciences at Stockholm.

DR. DAVID STARR JORDAN, of Stanford University, expects to spend the present summer abroad.

DR. N. L. BRITTON, director of the New York Botanical Garden, sails for Europe on May 27 to attend the International Botanical Congress, which meets at Vienna from June 11 to 18, and to visit foreign botanical gardens. He will be absent for about six weeks.

WE learn from the *Botanical Gazette* that Professor W. A. Kellerman, of Ohio State University, has returned from a three months' exploration of Guatemala with a large amount of material, especially of parasitic fungi.

DR. E. KOKEN, professor of geology at Tübingen, is about to return from a geological expedition to southern India and Ceylon.

DR. P. H. OLSSON-SEFFER, instructor in botany in Stanford University, will go to Soconusco, one of the southern provinces of Mexico, where he will spend three months experimenting with the Mexican rubber tree for the Zacualpa Rubber Plantation Company.

PROFESSOR A. JACOBI has been appointed to represent the faculty of medicine of Columbia University at the International Congress of Medicine to be held in Lisbon in April, 1906.

DR. WILLIAM OSLER sailed for Liverpool, on May 20, to assume the duties of the regius professorship of medicine at Oxford.

PROFESSOR IRA N. HOLLIS, professor of engineering at Harvard University, will be absent next year on leave.

ASSISTANT PROFESSOR D. S. SNEDDEN, of the department of education of Stanford University, has been given leave of absence for next year; Associate Professor E. P. Cubberley and Mr. A. H. Suzzallo, who have been spending the present year at Teachers College, Columbia University, will next year resume their work in the department of education.

Professors John C. Smock and Edward B. Voorhees, of Rutgers College, have been appointed to serve on the New Jersey State Forestry Commission.

Dr. J. Aderhold has been appointed director of the newly established Imperial Biological Institute for Agriculture and Forestry at Berlin.

The Paris Geographical Society has awarded its gold medal to Dr. Paul Doumer.

Henry Cook Boynton, instructor in mining and metallurgy at Harvard University, has been awarded the Carnegie research scholarship of $500 by the Iron and Steel Institute of London.

Professor Russell H. Chittenden, director of the Sheffield Scientific School, has been invited to deliver the annual Shattuck lecture before the Massachusetts Medical Society.

Foreign papers state that it is again proposed to affix a marble tablet to the Villa Medici, which is French property, to remind passers by and posterity that Galileo was kept prisoner there from June 24 to July 6, 1633. Italy has already erected a small monument to Galileo at the very door of the villa, with the following inscription: "The neighboring palace, which belonged to the Medici, was the prison of Galileo Galilei, guilty of having seen the earth revolving round the sun."

The deaths are announced of Dr. Henry Dufet, professor of physics at Paris, in his fifty-seventh year; of Dr. C. Eckhardt, professor of physiology at Giessen, in his eighty-third year; of Dr. Andreas Kornhuber, emeritus professor of natural history in the Institute of Technology at Vienna, in his eighty-fourth year; of Professor A. Piccini, professor of chemistry at Florence, and of Colonel Renard, director of the National Aeronautical Park at Meudon.

Plans for the International Congress of Radiology and Ionization to be held at Liége, September 12–14, 1905, are being rapidly matured. The 'Comité de Patronage' has been carefully selected and is an unusually dignified body, consisting of MM. Arrhenius, Barus, Becquerel, Berthelot, Birkeland, Blondlot, Bouchard, Crookes, Curie, D'Arsonval, Drude, Elster, Geitel, Goldstein, Hittorf, Kelvin, Larmor, Lenard, Lodge, Lorentz, Mascart, Nernst, Poincaré, Potier, Ramsay, Rayleigh, Riecke, Righi, Rutherford, Schuster, J. J. Thomson, Voigt and Wiedemann. It is hoped that an American committee may be arranged for at an early date, or at least that papers of a finished character may be sent from this country to the congress.

The Congrès des Sociétés savants met this year in Algeria under the presidency of M. Héron de Villefosse, president of the archeological section of historic and scientific work.

The following resolution was passed by the council of the Society of Arts at their meeting, held on May 8: "In view of the feeling which appears to have been aroused amongst some of the proprietors of the London Institution with regard to the proposed amalgamation with the Society of Arts, and the consequent probable difficulties of effecting a harmonious fusion of the two corporations into a single institution, the council of the Society of Arts have decided not to take any further action in the matter, and hereby discharge the committee which, at the instance of the board of managers of the London Institution, they appointed to consider the scheme for amalgamation."

The U. S. Civil Service Commission announces an examination on June 21, 1905, to secure eligibles from which to make certification to fill the following named vacancies in the positions of aid and laboratory apprentice (male) in the Bureau of Standards, Department of Commerce and Labor, and vacancies as they may occur in any branch of the service requiring similar qualifications: Three aids, at $600 per annum each; one laboratory apprentice, at $480 per annum; one laboratory apprentice, at $540 per annum.

It is announced that President Roosevelt will soon issue a proclamation setting aside about ten million acres of land in Idaho as a forest reserve.

The following subject has been selected as the subject for the Jacksonian prize of the Royal College of Surgeons for 1906: 'The

Diagnosis and Treatment of Those Diseases and Morbid Growths of Vertebral Column and Spinal Cord and Canal which are Amenable to Surgical Operations.'

ALTHOUGH detailed statistics for the production of gold during the last year are not yet available, Mr. Waldemar Lindgren, of the U. S. Geological Survey, has made some prognostications as to the distribution of the production among different classes of ore deposits. A preliminary estimate of the production of each state and territory was given out by the director of the Mint at the first of the year. According to this estimate, the production of gold in the United States during 1904 amounted to $84,551,300. After a period of very rapid advance in the gold production from 1892 to 1900, inclusive, during which an increase from $33,000,000 to $79,000,000 took place, there were two years of nearly stationary output and one year of decided decrease. It is, therefore, very satisfactory to find that the production of gold has risen again to record figures, the estimate being $84,551,300 against $73,591,700 for 1903. Mr. Lindgren classifies the gold production according to its derivation from placers, dry or quartzose ores, copper ores and lead ores. He estimates the production of gold from placers at $12,900,000, from quartzose gold and silver ores at $62,754,000, from copper ores at $4,300,000 and from lead ores at $4,600,000, making a total production of $84,554,000, a sum that practically agrees with the estimate of the director of the mint. Alaska is the largest producer of placer gold and should show a gain of at least $200,000, the output being estimated at $5,800,000. California will show an increase which may reach $800,000, the production being estimated at $4,800,000. The production of gold from quartzose gold and silver ores is subdivided by Mr. Lindgren into the production of pre-Cambrian quartz veins, $5,454,000; of Mesozoic quartz veins in the Pacific coast belt, $21,600,000; and of Tertiary gold quartz veins in the Rocky Mountains and Great Basin, $35,700, making a total of $62,754,000.

THE Belgian Royal Academy has, as reported in *Nature*, issued the following lists of prize subjects for 1905 and 1906: for 1905, in mathematical and physical sciences, on the combinations formed by halogens; on physical, particularly thermal, phenomena accompanying dissolution; on linear complexes of the third order; and on the deviation of the vertical treated from the hypothesis of the non-coincidence of the centers of mass of the earth's crust and nucleus. In natural sciences, on the function of albuminoids in nutrition; on the reproduction and sexuality of Dicyemidæ; on the silicates of Belgium; on the formations of Brabrant between the Bruxellian and the Tongrian; on certain Belgian deposits of sand, clay and pebbles; on the sexuality of the individuals resulting from a single ovum in certain diœcious plants; and on the development of *Amphioxus*. For 1906 the subjects in mathematical and physical sciences are: on critical phenomena in physics; on n-linear forms ($n>3$); on thermal conductivity of liquids and solutions; and on the unipolar induction of Weber. In natural sciences, on the Cambrian series of Stavelot; on the effect of mineral substances on the assimilation of carbon by organisms; on the effects of osmotic pressure in animal life; on the tectonic of Brabrant; on the soluble ferments of milk; and on the physiological action of histones. The essays for 1905 and 1906 are to be sent in by August 1 of the respective years, and the prizes range from $120 to $200 in value. In addition, prizes bequeathed by Edward Mailly and in memory of Louis Melsens are offered under the usual conditions for astronomy and applied chemistry or physics respectively.

UNIVERSITY AND EDUCATIONAL NEWS.

THE cornerstone of the library building of Leland Stanford Junior University was laid on May 15. The building will cost $800,000. At the ceremonies an address to the students by Mrs. Stanford was read. In it she makes the amount realized from the sale of her jewels, which are estimated to be worth $500,000, an endowment fund for the library.

GRADUATES of Yale University have arranged to purchase for the university the Hillhouse

estate, containing thirty acres and costing $510,000. This purchase fixes definitely the direction of Yale's growth northward beyond the present site of the Sheffield Scientific School.

It was announced at the meeting of the Yale Corporation, on May 15, that a gift had been received by Yale from a Harvard graduate—whose name was withheld—for the purpose of cementing the good feeling between the two universities. The use of the fund was left entirely to the Yale Corporation, which has voted to expend it for securing from time to time lecturers from Harvard to speak before the students of Yale. President Eliot, of Harvard, has accepted the corporation's invitation to be the first lecturer.

The University of Indiana has been granted $100,000 by the state legislature for the erection of a new library.

Work is about to be started on the new science hall of Colby University, which will be erected at a cost of about $90,000.

Dr. D. K. Pearsons, of Chicago has made a gift of $50,000 to Montpelier Seminary at Montpelier, Vt., which he attended, conditional upon the institution raising $100,000 within a year.

At the annual meeting of the National Academy of Design it was voted to accept the offer of Columbia University to form an affiliation. It is planned to collect $500,000 for a building, which will be erected on a site furnished by Columbia University.

The University of North Dakota will open a medical college in the autumn of 1905. Until the clinical advantages are adequate the medical course will extend only through the first and second years of the four years' curriculum. Students who have completed the work at the University of North Dakota will be received into the junior year of the medical schools with which articulation is arranged.

The Medical College at Bahia, Brazil, with its equipment and valuable library, has almost totally been destroyed by fire.

Dublin University has recently opened its degrees to women, and the first result has been somewhat curious. Students who have done their work at Oxford or Cambridge may receive the bachelor's degree at Dublin. As is well known, Oxford and Cambridge do not give their bachelor's degree to women, and eighty-four women who had completed the work for the degree at these universities have received the degree from Dublin on the payment of $50 each.

Professor Asaph Hall, Jr., has resigned as professor of astronomy and director of the observatory at the University of Michigan. Professor W. T. Hussey, of the Lick Observatory, has been elected his successor. Professor Hussey was graduated from Michigan in 1889.

Samuel J. Barnett, assistant professor of physics at Stanford University, has accepted the chair of physics at Tulane University, vacant by the resignation of Dr. Brown Ayres to accept the presidency of the University of Tennessee.

The department of physics in the University of California has secured the appointment of Dr. A. S. King and Dr. A. W. Gray for the coming year, as instructors. Dr. King will continue the spectroscopic investigations on which he has published already a number of papers. Dr. Gray returns from the University of Leyden, where he has been working in the cryogenic laboratory, to a 'Research Instructorship on the Whiting Foundation,' supported from the income of the bequest of Harold Whiting, formerly associate professor of physics in the University of California.

At Williams College, Mr. William E. McElfresh has been promoted to the Thomas T. Reed professorship of physics, and Mr. Herdman L. Clelland to a professorship in geology.

Dr. E. B. Holt has been appointed assistant professor of psychology at Harvard University.

Dr. A. R. Ferguson, senior assistant to the professor of pathology in Glasgow University, has been appointed professor of pathology in the Medical School, Cairo.

The council of the Linnean Society of New South Wales has appointed Mr. Harald I. Jensen to be the first Linnean Maclay fellow.